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Achieving Connectivity Through Smart City Initiatives in Madinat Al Irfane, Rabat, Morocco

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CONSEIL D'ARRONDISSEMENT AGDAL RYAD

Achieving Connectivity Through Smart City Initiatives in Madinat Al Irfane, Rabat, Morocco

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Abstract

Our project assists the work of Dr. Badiaa Bennani and Dean Mohamed Essaaidi to implement smart city initiatives in the area of Madinat Al Irfane of Rabat, Morocco in order to better connect the various institutions. We held a focus group with students and surveyed members of different institutions to understand a connectivity initiative that appeals to them the most. We conducted interviews with five local experts of smart city research in various fields to determine the feasibility of creating a smart city in Madinat Al Irfane. We developed a list of five connectivity initiatives to be implemented to improve the infrastructure of the area in order to promote smart city components to provide members of different institutions an opportunity to connect.

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Authorship

To complete this project, the three of us collaborated in the following ways:

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Abstract	Everyone	Everyone
Executive Summary	Everyone	Everyone
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Executive Summary

Currently, 1 in 8 people live in 33 continuously growing megacities worldwide, but some of the fastest growing urban cities are ones with fewer than 1 million inhabitants, many of them located in Africa (Pesantez, 2018). As a city's population increases, the community must evolve by working together in order to economically and socially survive. Rabat is one of the most populated cities in Morocco (Central Intelligence Agency, 2017). Within the last two decades, Rabat's population has grown by roughly one fifth (World Population Review, 2018). This large concentration of people could greatly benefit one's access to new information, as close proximity to people of different educational backgrounds can cultivate innovative ideas (Clark, 2003).

L'Arrondissement Agdal-Ryad and Mohammed V University

The project was completed in collaboration with our sponsors, Dr. Badiaa Bennani and Dean Mohamed Essaaidi. Dr. Bennani is the President of the Conseil de L'Arrondissement Agdal-Hay Ryad. Dean Essaaidi is the director of ENSIAS, an engineering institution in Mohammed V University. To manage urbanization and better connect the community, Rabat city officials aim to implement connectivity initiatives that demonstrate smart city ideas (Conseil de l'Arrondissement, 2018). A smart city enhances human connection through innovation to improve the citizen's wellbeing. There are four pillars that define a smart city, and a specific initiative can be categorized into one of these pillars: sustainability, economy, government, and education (Vesco and Ferrero, 2015). An underlying theme among each pillar is the importance of connectivity. A community must work together so that the implementation of smart city initiatives is successful.

Madinat Al Irfane, an area of higher education in the Agdal-Ryad district of Rabat, will be used as a testbed to implement a pilot smart city design for all of Rabat. There are 19 different institutions within this area, each isolated from one another by walls, guards, and cultural norms (Conseil de l'Arrondissement, 2018). The concept of a connectivity initiative, a physical and virtual notion that promotes human connection using smart city ideas, is lacking between the students, faculty, and staff of the separate institutions.

Goal and Objectives

The goal of our project was to develop a preliminary recommendation to interconnect the institutions of Madinat Al Irfane and ultimately enhance the quality of life of the community using smart city initiatives. Three objectives allow us to achieve this goal:

1. Identify a connectivity initiative that will interconnect the main stakeholders
2. Identify a location where a connectivity initiative would be most impactful
3. Develop a preliminary recommendation to interconnect the district

Identifying a connectivity initiative

The first step in Objective 1 was to understand the lack of connectivity from the main stakeholder's perspective, since our efforts directly impact them. This was completed by conducting a focus group of students of Madinat Al Irfane.

Our focus group was held with members of Forum GENI Enterprises, an organization that connects students from four engineering institutions in Madinat Al Irfane. The discussion consisted of eight participants, and the topics revolved around the current state of connectivity between institutions.

We learned that individual institutions within Madinat Al Irfane act as separate entities with separate resources including clubs, classes, cafeterias, and libraries. Each institution provides its members with services that aim to enhance a student's quality of life, however, this kind of restriction prohibits members from meeting students from other institutions, resulting in a lack of connectivity. The focus group participants revealed that the students seek more collaboration with students of other institutions, but they lack the means for doing so. Additionally, students claim they lack a good enough reason to leave their individual campuses, since there are not many choices nearby that are reasonably priced. The transcript of the focus group discussion was coded, and tallied shown in Table 1. Each theme was tallied and marked either positive or negative in relation to connectivity. From the opinion of the students, education, namely the structure of courses and the lack of collaboration between students of different majors, and infrastructure, specifically relating to the walls separating different institutions and the lack of gathering spaces outside of the walls, limit connectivity within Madinat Al Irfane.

Table 1: Code for Focus Group of Connectivity Themes

Theme	Code	Pattern	Positive	Negative	Total
Sports			4	4	8
Clubs			2	3	5
Media			3	6	9
Education			3	13	16
Economy			0	0	0
Infrastructure			1	9	10
Culture			5	6	11
Technology			0	0	0

Following our focus group, we used Qualtrics to create an online survey with the goal of understanding the broader perspective of students, faculty, and staff on potential connectivity initiatives. The survey contained demographic questions, fill in questions, and a Likert Scale was used in which the following statements were scored:

1. I would like more opportunities to connect with people in institutions other than mine.
2. I would participate in clubs and/or sports leagues with members of another institution.
3. I would enjoy participating in a district-wide sporting event.
4. I wish there were more methods of communicating with other students.

5. I would like a mobile application to notify me of events happening on campus.
6. I would like to have more common spaces to gather with friends outside of my campus.
7. I believe a centrally located library for all the institutions in the district would be utilized.
8. I would utilize a sport complex open to the entire district.

Respondents were prompted to rank each statement as either 1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, or 5: Strongly Agree. The last section was our main focus when analyzing responses.

We received a total of 73 surveys, with 57 fully completed. From the 57 completed surveys, 5 were from staff members, 1 was from a professor, and 51 were from students. Only the 51 student responses were statistically analyzed. Statement 5, "I would like a mobile application to notify me of events happening on campus", statement 6, "I would like to have more common spaces to gather with friends outside of my campus", and statement 7, "I believe a centrally located library for all the institutions in the district would be utilized", had the highest average scores, and performing a t-Test proved that these three statements hold equal weight and therefore one should not be favored over the other when considering a potential solution.

Identifying a location for a connectivity initiative

In order to fully comprehend the connectivity in Madinat Al Irfane, the team assessed the physical limitations and identified areas of high connectivity. This was performed by analyzing maps and observing specific locations determined through the map analysis. Since security is part of the culture in Morocco, only members of a specific institution can enter their campus. Therefore, the location for a solution must be outside any walled area and in a central location. The City Council provided us with a detailed map of Madinat Al Irfane that we analyzed to determine locations of walls and open areas not enclosed by walls. Once this was done, we observed the areas from our map analysis and found that there were much fewer open areas than we originally thought. We also found that Madinat Al Irfane lacks sidewalks, benches, and trash bins. Figure 1 displays our findings from the map analysis and observations.

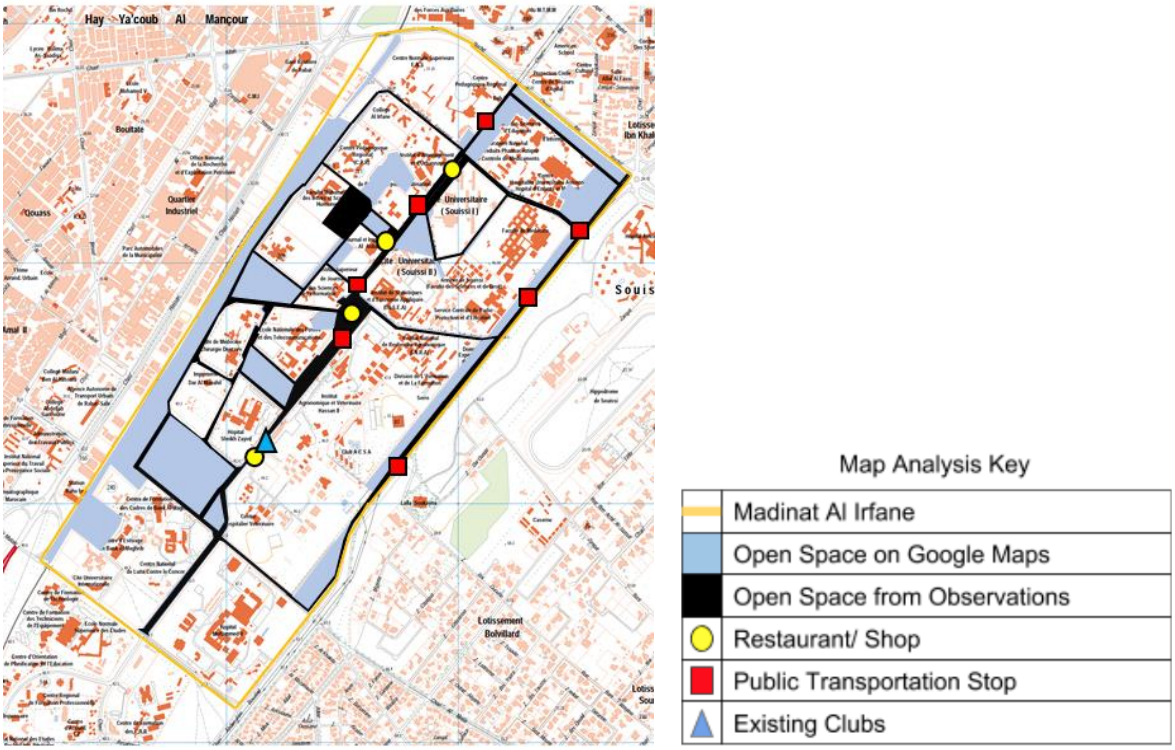

Figure 1: Result of Map Analysis and Observations Madinat Al Irfane

Expert Interviews

The final step of the project was to interview local experts to gain their perspective on current problems and the feasibility of potential solutions relating to connectivity. We spoke with five professors with smart city research experience, each with backgrounds varying in urban planning, computer engineering, and entrepreneurship. We coded a summary of the interviews with the same eight themes as the focus group and tallied by the amount of times each theme was mentioned in a positive or negative way in relation to connectivity, shown in Table 2.

Table 2: Code for Interviews of Connectivity Themes

Theme	Code	Pattern	Positive	Negative	Total
Sports			1	2	3
Clubs			4	1	5
Media			4	4	8
Education			9	9	18
Economy			7	5	12
Infrastructure			1	17	18
Culture			6	18	24
Technology			4	5	9

According to these experts, the themes of infrastructure and culture are the two main factors prohibiting connectivity in Madinat Al Irfane. Each interview brought a different perspective of the challenges that affect connectivity. These challenges include a lack of networks connecting people and allowing them to access general information, a disconnect between experts working on similar research, and minimal public space suitable for collaboration. Financial restrictions were also mentioned in our interviews, since a potential solution would not be on one particular campus and it would have to be paid for by many institutions in order for students to feel like the space is theirs. There is also a cultural dimension to the challenges including an "us vs. them" mentality where private property is maintained by individuals but public property is assumed to be the government's responsibility and is not respected like private property. We learned that it is important to understand what the people being impacted want rather than trying to implement something we think is best. The professors stressed the importance of understanding the cultural aspect of implementing smart city initiatives in a developing country. It is important that a solution recognize the needs of the people.

Connectivity Initiative

Based on our findings, we recommend five different connectivity initiatives to be implemented:

1. **Centrally located multimedia space**
2. **Outdoor seating areas**
3. **Increased number of competitions**
4. **Website for research information**
5. **Social committee**

The implementation of these five recommendations will provide members of the institutions with multiple physical locations to gather, methods for connecting, and the means for collaborating. Each recommendation is validated from the comparative analysis of the results from our three objectives.

1.0 Introduction

The urban world population has grown rapidly from 751 million city dwellers in 1950 to 4.2 billion in 2018 (Pesantez, 2018). As a city population increases, the community must evolve by working together in order to economically and socially survive. Currently, 1 in 8 people live in 33 continuously growing megacities worldwide, but some of the fastest growing urban cities are ones with fewer than 1 million inhabitants, many of them located in Africa (Pesantez, 2018).

Rabat is one of the most populated cities in Morocco (Central Intelligence Agency, 2017). Within the last two decades, Rabat's population has grown by roughly one fifth (World Population Review, 2018). This large concentration of people could greatly benefit one's access to new information, as close proximity to people of different educational backgrounds can cultivate innovative ideas (Clark, 2003). The city has initiated multiple infrastructural projects to address the steady influx of people, although there is a lack of social improvements that limit the interconnection between citizens (Fore, 2018).

To manage urbanization and better connect the community, Rabat city officials aim to implement connectivity initiatives that demonstrate smart city ideas (Conseil de l'Arrondissement, 2018). A smart city enhances human connection through innovation to improve the citizen's wellbeing. There are four pillars that define a smart city, and a specific initiative can be categorized into one of these pillars: sustainability, economy, government, and education (Vesco and Ferrero, 2015). An underlying theme among each is the importance of connectivity. A community must work together so that the implementation of an initiative is successful.

Madinat Al Irfane, an area of higher education in the Agdal-Ryad district of Rabat, will be used as a testbed to implement a pilot smart city design for all of Rabat. There are 19 different institutions within this area, each isolated from one another by walls, guards, and cultural norms (Conseil de l'Arrondissement, 2018). Through connectivity, the members of one institution can be exemplified through the ideas of an entire team of people from multiple institutions working together to improve the university (Paulus and Nijstad, 2003). The concept of a connectivity initiative, a physical and virtual notion that promotes human connection using smart city ideas, is lacking between the students, faculty, and staff of separate institutions.

The goal of this project is to develop a preliminary recommendation to interconnect the institutions of Madinat Al Irfane and ultimately enhance the quality of life of the community. Three objectives allow us to achieve this goal. The first objective is to identify a connectivity initiative that appeals most to the main stakeholders. The second is to identify a location where an initiative would be most impactful. The third is to obtain smart city expert opinions on the feasibility of our preliminary recommendations.

As a result of our data collection, our team proposes a list of five recommendations to be implemented in Madinat Al Irfane including a centrally located multimedia space, outdoor seating areas, an increased number of competitions, a website for research information and a social committee.

2.0 Background

This chapter provides information on Rabat, Morocco and the area of Madinat Al Irfane in the context of assessing the implementation of smart city initiatives. The team summarizes urbanization in Rabat, identifies the stakeholders of the project, provides the reader with the definition of a smart city, and discusses connectivity in Madinat Al Irfane and how it can aid in the implementation of a smart city.

2.1 Description of Madinat Al Irfane, Rabat, Morocco

Due to urbanization, the percentage of the world's population living in cities is expected to increase from 55% to 68% by the year 2050 (Pesantez, 2018). Urbanization, or the movement of people from rural to urban areas, creates a change in the environmental and social aspects of a community. An increase in population also means an increase in food, water, energy consumption, and land use. These factors must be addressed for a city to survive a population growth. To ensure a city endures urbanization in a healthy way, there is a need for sustainable and innovative measures to promote an interconnected society.

Morocco has seen the effects of urbanization directly. As of 2010, the urban population of Morocco was 58% of the total population, with a rate of urbanization at 2.1% annual rate of change (Morocco Population 2019, 2019). Specifically in Rabat, the capital of Morocco, the population has grown by roughly one fifth in the last two decades, to a population of 1.65 million today (World Population Review, 2018). Starting in 2014 was Rabat's "City of Lights" initiative in which the goal was to promote cultural heritage, preserve green space, improve the economy, and allow access to social services, governance, and road infrastructure. Millions were spent on new buildings, highways, and cultural services. However, this new infrastructure did little to assist in connecting the community (Fore, 2018). In order for a city to run successfully, it is crucial to balance the changing infrastructure and the changing society.

In the context of this project, Madinat Al Irfane will be used to implement a pilot smart city design as a test bed for the city of Rabat. Madinat Al Irfane is an area known as the City of Knowledge, located in the district of Agdal-Ryad, which is one of six districts in the city of Rabat. Within Madinat Al Irfane, there are 19 different institutions, each a part of Mohammed V University. Mohammed V University is the largest public university system in Morocco and includes 63,554 students, 2,428 professors and researchers, and 1,643 administrative staff members (Composition de l'UM5R, 2016). For clarification purposes, Mohammed V University will be referred to as "university" and the individual campuses within the university will be referred to as "institutions". The university is governed by a board of directors, consisting of the President of the university, four Vice Presidents, a Secretary General, and 18 Deans of the individual institutions. The different institutions offer a variety of disciplines, including medicine, art, engineering, and religion and there are multiple hospitals, residences, and businesses located among them. A map of Madinat Al Irfane is shown in Figure 2.

Figure 2: Satellite Map of Madinat Al Irfane in Rabat, Morocco (Google, 2018)

2.2 Stakeholders

The key stakeholders of this project are those involved in the higher education system in Madinat Al Irfane due to their direct involvement in the education of the area. This includes the students, professors, researchers, and staff members of the University. When a smart city is initiated in the entire city of Rabat, the main stakeholders become all inhabitants of the city, including residents, non-residents and visitors.

The project will be completed in collaboration with our sponsors, Dr. Badiaa Bennani and Dean Mohamed Essaaidi. Dr. Bennani is the President of the Conseil de L'Arrondissement Agdal-Hay Ryad. Dean Essaaidi is the director of ENSIAS, an engineering institution within Mohammed V University. Both Dr. Bennani and Dean Essaaidi's main goal for this project is to create a pilot smart city in Madinat Al Irfane that will encourage innovation, collaboration, entrepreneurship, and creativity (Conseil de l'Arrondissement, 2018).

2.3 Definition of a Smart City

Although the term "smart city" can have varying definitions based on the different needs that each city displays, the definition that we adapted from an analysis of multiple examples is *a city that enhances human connection through innovation to improve the citizens' wellbeing*. Human connection through social interactions can benefit a person's health and therefore is vital to a city's quality of life (Umberson and Montez, 2010). Through research, we identified recurring themes that characterize a smart city which we have grouped into four general pillars: sustainability, economy, government, and education. One underlying theme among the four is the importance of connectivity. Below is a definition and case study of each pillar, providing examples of how the smart city theme was used as a method of interconnecting a community.

2.3.1 Sustainability

A connectivity initiative that entails sustainability stresses the importance of a large group's impact on the environment. The impact on the environment of an entire group working together is greater than that of an individual (Solano, Casado, Ureba, 2016). One element of a smart city can be achieved when a group of students in Madinat Al Irfane consider their impact on the environment when they are working on current problems.

Rhodes University located in South Africa implements many sustainable practices and has acted as a model for other universities in its region. Specific initiatives include the creation of an environmental committee that organizes events for people to come together to volunteer and help the community and the creation of forums for new environmental programs to promote collaboration (Togo and Lotz-Sisitka, 2013).

2.3.2 Economy

A connectivity initiative regarding the economy allows businesses and institutions to work together to exchange ideas (Porumb and Ivanova, 2014). A smart city's economy is nearly self-sufficient and develops cohesion between public, private, and nonprofit sectors working towards the common fiscal and social health of the city (Etzkowitz, 2008).

Collaboration between universities and local industries has spiked in integrated research deals. Companies increasingly continue to relocate closer to college districts (Lutchen, 2018). Cambridge, MA is an ideal case of this, with companies such as Pfizer, General Electric, and Philips Healthcare located in the greater Boston area. The cost of research and development within companies is comprised of new equipment, machinery, staff, and facilities. It is more cost effective for a company to partner with organizations that already have existing research, and projects, such as universities. Collaboration between industry and universities can add value to the economy and can therefore advance a city towards smart city status (Porumb and Ivanova, 2014).

2.3.3 Government

A connectivity initiative in regards to the governance of a city stresses community involvement in government decisions so that services can be implemented to enhance the community's well-being. This allows members to share their voice and participate in the management of their community (Monfaredzadeh and Krueger, 2015). Additionally, some government services can be digitized so that data is more easily organized and accessible. This allows ideas and information to be shared over the internet with citizens, leading to interconnection and collaboration (Chourabi et al., 2012).

Portland State University (PSU) implements a connectivity initiative of joining community members with students and faculty through a governance committee, in charge of budgeting and researching for a better campus environment (Choi, Oh, Kang, & Lutzenhiser, 2017). The committee partners students and researchers with community members to allow students to assist in developing solutions to community issues that may affect them (Hudson, 2019).

2.3.4 Education

A connectivity initiative in relation to education emphasizes collaboration. It would grant the opportunity for personal knowledge and experience of each individual to build off of one another to work together and adapt to a changing society by developing solutions to problems that arise (Santana-Mancilla et al., 2013).

The library at Beijing Normal University contains elements of a smart city that advances the entire university to a smart system. Instead of traditional classrooms, the library contains informal learning spaces and multimedia space. The learning spaces at this university motivate and facilitate learning by supporting collaboration and creating a personalized, yet inclusive environment (Zhang et al, 2015). This university library demonstrates how a space can be supportive of collaboration and inspire connectivity.

2.4 Connectivity in Madinat Al Irfane

Through our case study analysis, we found that connectivity is the backbone of each smart city pillar (Togo and Lotz-Sisitka, 2013; Porumb and Ivanova, 2014; Hudson, 2019; Zhang et al, 2015). Connectivity made each initiative a success, and therefore you cannot implement smart measures without an interconnected community. Connectivity can improve the overall quality of life because social relationships benefit a person's health (Umberson and Montez, 2010). Initiatives that promote and protect these social relationships can have long-term payoffs on the well-being of the members of Madinat Al Irfane. There are both social and physical barriers that must be addressed in order to promote connectivity. Cultural barriers relate to social phenomenon that discourage connectivity, including concepts like a lack of desire to connect with other people or a cultural divide between men and women that prohibits intermingling. Physical barriers relate to anything physical that prohibits connectivity, including walls between institutions, gated areas with guards, and a lack of communal open space.

As the test bed for a pilot smart city design, Madinat Al Irfane must promote collaboration and connectivity prior to implementing definitive smart city initiatives in order for a smart city to be successfully integrated. Some possible limitations to the connectivity of Madinat Al Irfane are the physical walls that separate institutions. The current structure prohibits students from different institutions from collaborating together because the curriculum does not allow for students to take classes across institutions. The current structure has been the same for many years and has ingrained itself into the culture of Madinat Al Irfane.

2.5 Summary

This chapter describes the current state of Rabat, Morocco in the context of urbanization and the need for more social and infrastructural improvements. From a literature review, the team was able to build a definition of a smart city, identify four pillars that categorize a smart city, and validate each pillar with a case study related to an educational environment so that the information gained from the case studies can be compared to Madinat Al Irfane. Finally, the theme of connectivity was chosen due to its importance in smart city implementation and the lack of connectivity was then analyzed in Madinat Al Irfane. The team used the information gained in this chapter to formulate our methodology.

3.0 Methodology

The goal of this project was to identify a solution that can better connect the members of the different institutions of Madinat Al Irfane using smart city initiatives to improve the overall quality of life. To achieve this goal, three objectives were addressed:

Objective 1: Identify a connectivity initiative that interconnects the main stakeholders.
Objective 2: Identify a location where a connectivity initiative would be most impactful.
Objective 3: Develop a preliminary recommendation to interconnect the district.

An overview of the process is shown in Appendix A and the detailed timeline of the project can be found in the Gantt Chart in Appendix B.

3.1 Identify a connectivity initiative

The first step in Objective 1 was to understand the lack of connectivity from the main stakeholder's perspective, because our efforts directly impact them. This was completed by conducting a focus group of students and a survey for students, professors, and staff.

3.1.1 Conducting a discussion with a focus group

A focus group is a discussion in which the group shares information and individual perceptions based on a common area of interest (Chalofsky, 1999). Our focus group was held with members of Forum GENI Enterprises, an organization that connects students from four engineering institutions in Madinat Al Irfane. The discussion consisted of eight participants, ensuring that everyone was able to share their own perspectives revolved around the theme of connectivity between the institutions in Madinat Al Irfane (Chalofsky, 1999). Each member of the discussion had at least one year of attendance at their university, to ensure an understanding of the current state of the connectivity between the institutions (Rea and Parker, 2014). A student member of Forum GENI Enterprises, Oumaima Alami, helped us identify the participants. Additionally, a consent form, found in Appendix C, was distributed at the start, in compliance with the approval of the Worcester Polytechnic Institute Institutional Review Board Application, shown in Appendix D. We designated one member to be the speaker and two to be the notetakers. The outline prepared to guide the discussion can be found in Appendix E.

3.1.2 Conducting a Student, Faculty, and Staff Survey

Using the web application Qualtrics, an online survey was created to understand the perspective of the students, faculty and staff on potential connectivity initiatives. The survey was written in English and French and can be seen in Appendix F. Through the laws of variance and standard deviation, the survey required a minimum of 59 responses, allowing a large range of opinions from many people of different institutions (Bartlett et al., 2001). Dean Essaaidi gave permission for the survey to be administered and emailed the survey to the faculty and students of ENSIAS. Additionally, Forum GENI posted the survey to their Facebook page which reaches over 1,000 students and the survey was emailed to 12 professors of different institutions, provided by Dr. Bennani. One team member traveled around the district with a translator, Mohammed Salhi, a doctoral student of ENSIAS and the liaison between WPI IQP projects and Mohammed V

university, and randomly selected members of the staff to partake in the survey. The project was explained and survey responses were collected using Qualtrics. A setting on Qualtrics prevented respondents from filling out the survey more than once (Qualtrics, 2017).

3.2 Identify a location for a connectivity initiative

In order to fully comprehend the connectivity in Madinat Al Irfane, the team gauged the physical limitations and identified areas of high connectivity. This was assessed by analyzing maps and observing specific locations. The team used Google Maps and a digital map of Rabat, shown in Appendix G, created by the district Agdal-Ryad and provided by Mohammed Salhi. We highlighted and pinpointed areas of interest, shown in Appendix H. The highlighted and pinpointed areas are accessible for members of all institutions and are therefore a potential location for a connectivity initiative. The team visited the pinpointed locations in areas unrestricted by walls determined through the map analysis in order to observe the feasibility of a location for a connectivity initiative. We noted the accessibility of the location and the centralization to the surrounding institutions. The map analysis was verified, shown in Appendix H, by highlighting areas actually not enclosed by walls in black. These methods provided insight on the physical barriers that prohibit connectivity within the district to ensure a solution does not face the same barriers.

3.3 Develop Preliminary Recommendations

The final step of the project was to formulate recommendations. We spoke with smart city experts and analyzed the data from the previous methods to propose a solution.

3.3.1 Interview Smart City Experts

Experts in smart city research, specifically in Rabat, provided opinions on the current state of connectivity between institutions. We interviewed five smart city professionals, their contacts provided by Dean Essaaidi and Dr. Bennani, and our advisors. Before interviewing, we assigned the roles of interviewer and notetakers. The consent form, found in Appendix I, was handed out and an explanation of our project was shared. The questions that were asked to each professional to facilitate the discussion can be found in Appendix J.

3.3.2 Comparative Data Analysis

To obtain quantitative data from the qualitative methods of the focus group and interviews, we used coding techniques (Saldanna, 2013). The summaries of the focus group discussion and interviews were coded. The survey responses were quantitatively analyzed using graphing methods and statistical testing. A comparative data analysis was performed to find common trends between the collected qualitative data of the focus group and interviews (Gorden, 1992). The quantitative data of the survey results was analyzed by performing a statistical analysis (Wallace and Valcik, 2008). The in-depth comparative data analysis is discussed in Chapter 4.

4.0 Results and Analysis

The following section presents the results and the analysis of the collected data in preparation for a proposal of recommendations to improve the connectivity between the students of different institutions in Madinat Al Irfane. Analysis of the information discussed in the student focus group guided us to the survey which was used to assess the opinion of a larger audience on specific initiatives that could improve the interconnection between the institutions. Along with the focus group and survey, we examined two maps of the district to identify the physical barriers prohibiting connectivity. From the map analysis, we observed particular areas of interest to understand the implications of the walls and locate an open space where a connectivity platform would be most impactful. During interviews with local experts with smart city experience, we obtained expert opinions on the feasibility of a solution that helps in overcoming the social and physical barriers that exist between the institutions of Madinat Al Irfane.

4.1 Results from Focus Group Discussion

We gained the perspective of the main stakeholders on initiatives that could interconnect the institutions through a focus group with eight students from ENSIAS, Institut National de Statistique et d'Economie Appliquée (INSEA), Ecole des Sciences de l'Information (ESI), and National Institute of Posts and Telecommunications (INPT). We coded a summary of the discussion, found in Appendix L, that shows highlighted words and phrases in a specific color "code" that correlates to a theme. The themes categorize different components of campus life and will display which component of campus life needs the most improvement from a connectivity initiative. The definition of each theme in the context of this project is found in Appendix K. If the theme highlighted is mentioned as improving or inspiring connectivity, it is considered positive. If the theme is mentioned as discouraging or prohibiting connectivity, it is considered negative. Table 3 tallies each time a theme was mentioned in a positive or negative way in relation to connectivity in the summary of the focus group. The themes were grouped in the three categories of positive, negative, and total.

Table 3: Code for Focus Group of Connectivity Themes

Theme	Code	Pattern	Positive	Negative	Total
Sports			4	4	8
Clubs			2	3	5
Media			3	6	9
Education			3	13	16
Economy			0	0	0
Infrastructure			1	9	10
Culture			5	6	11
Technology			0	0	0

The summaries or results for each theme that were mentioned in a positive way towards connectivity can be visualized in the pie chart shown in Figure 3 using the pattern each theme corresponds to, shown in the legend in Table 3.

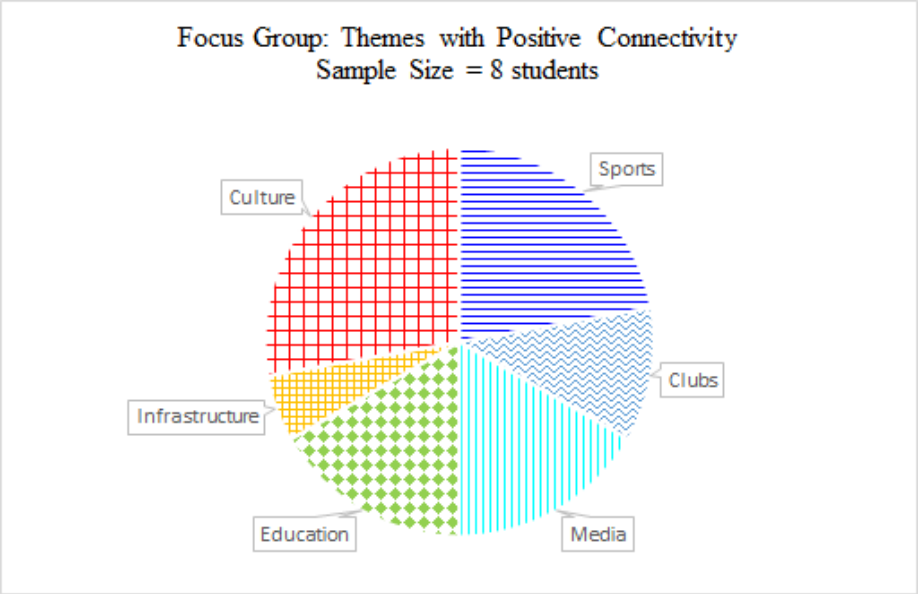

Figure 3: Focus Group: Frequency of Themes with Positive Connectivity

The summaries for each theme that were mentioned in a negative way towards connectivity can be visualized in the pie chart shown in Figure 4.

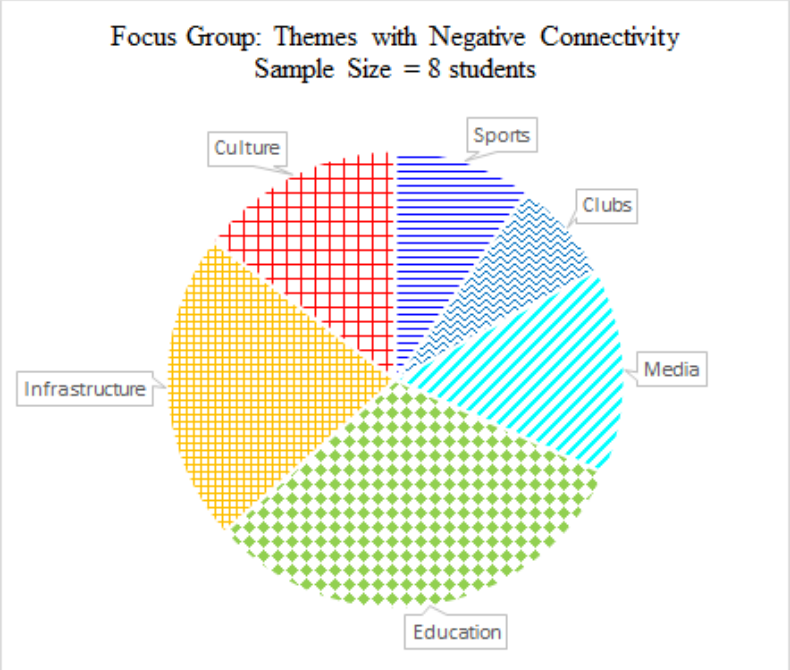

Figure 4: Focus Group: Frequency of Themes with Negative Connectivity

From these results, it can be seen that, according to the students, themes like culture and sports are viewed as existing methods of connectivity between institutions. Conversely, the theme of education, an aspect that involves connecting for education purposes, and infrastructure, an aspect that involves a physical space, are two areas students mentioned that currently prohibit the connectivity within Madinat Al Irfane.

From the focus group, we found that individual institutions within Madinat Al Irfane act as separate entities with separate resources including clubs, classes, cafeterias, and libraries. Each institution provides its members with services that aim to enhance the student body's quality of life, however, this kind of restriction prohibits members from meeting students from other institutions, resulting in a lack of interaction and potential collaboration between institutions. The discussion with the focus group further revealed that the students seek more interconnection with members of other institutions, but they lack the purpose for doing so. Students would like a purpose to leave their campus, but in their opinion, there is no attraction to go as well as no purpose. For example, students mentioned a place called they call the Market in the center of Madinat Al Irfane that has shops and restaurants. The students shared that while this place serves a purpose, it is a bit old fashioned and dated and they would like something more modern.

4.2 Results from Interviews with Experts

We gained the perspective of local experts on the current connectivity problems and the feasibility of potential solutions through interviews with five professors, each with experience ranging in Urban Planning, Computer Engineering, and Entrepreneurship. The experts who were interviewed were Professor Fatima-Zahra Beloudha, the Head of Computer Engineering Department at Ecole Mohammadia des Ingénieurs (EMI), Professor Slimane Bah, a professor of Computer Engineering at EMI, Professor Touria Belhoussine Idrissi, the Director of Studies at the National Institute for Urban and Territorial Planning (INAU), Professor Assia Lamzah, the Head of the Pedagogical Department and teaches many classes on Urban Planning and the History of Architecture in Morocco, and Professor Karima Ghazouani, the Director of the Mohammed V University Rabat University Center for Entrepreneurship. We coded a summary of the interviews, found in Appendices M, N, and O. The interview summaries were coded by the same eight themes as the focus group and tallied by the amount of times each theme was mentioned in a positive or negative way in relation to connectivity, shown in Table 4.

Table 4: Tallies for each Theme in Interview Summaries

Theme	Code	Pattern	Positive	Negative	Total
Sports			1	2	3
Clubs			4	1	5
Media			4	4	8
Education			9	9	18
Economy			7	5	12
Infrastructure			1	17	18
Culture			6	18	24
Technology			4	5	9

The compiled data for each theme that were mentioned in a positive way towards connectivity can be visualized in the pie chart shown in Figure 5.

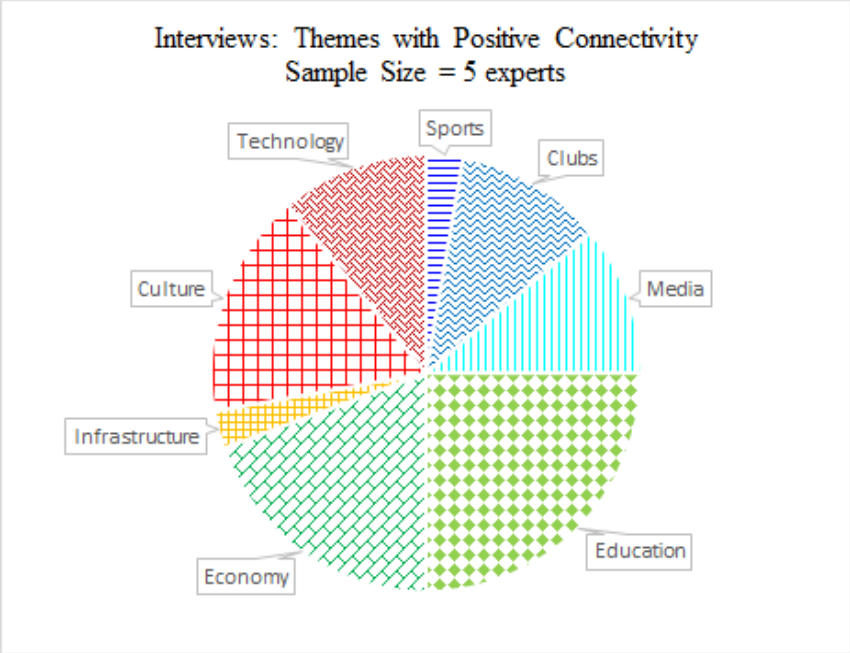

Figure 5: Interviews: Coded Results of Themes with Positive Connectivity

The summaries for each theme that were mentioned in a negative way towards connectivity can be visualized in the pie chart shown in Figure 6 using the "pattern" each theme corresponds to.

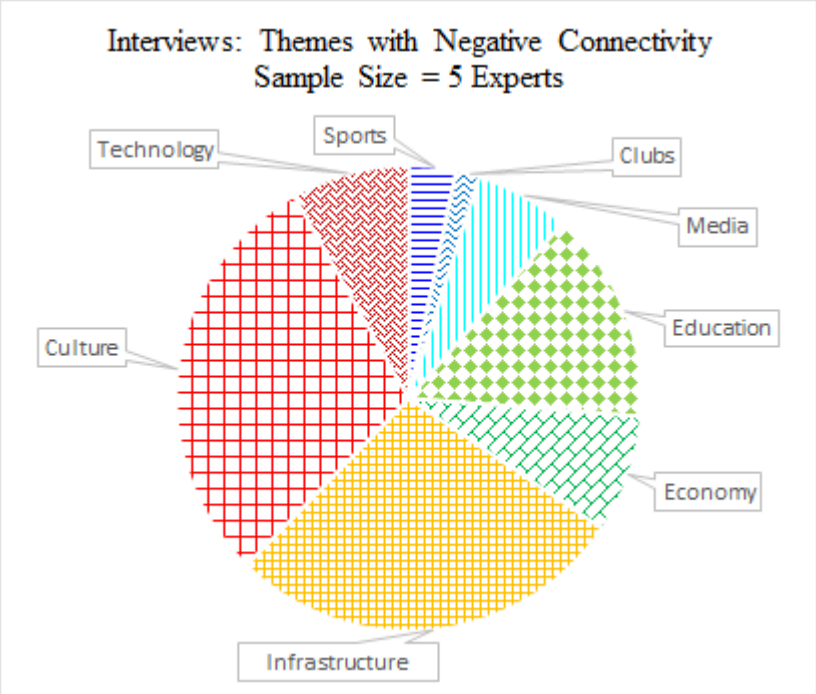

Figure 6: Interviews: Coded Results of Themes with Negative Connectivity

From these results, it was shown that the experts mainly believe that the categorical themes of education and economy, defined in Appendix K, within Madinat Al Irfane are the most positive

when it comes to promoting connectivity. However, the themes of infrastructure and culture are the two main categories that prohibit connectivity.

Each interview brought a different perspective of smart cities and various challenges that affect the connectivity. These challenges include a lack of networks connecting people and allowing them to access general information (Beloudha, personal communication, Jan 30, 2019). There is a lot of research being done within institutions but there lacks a way of connecting those completing the research (Bah, personal communication, Jan 30, 2019). Additionally, there is a lack of public space suitable for collaboration (Ghazouani, personal communication, Feb 12, 2019) and a lack of financial resources available to create new spaces (Belhoussine, personal communication, Feb 13, 2019). Each institution has their own space but there is no place where all institutions could come together without feeling like they are on another institution's property (Ghazouani, personal communication, Feb 12, 2019). There is also a cultural dimension to the challenges including an "us vs. them" mentality where private property is maintained by individuals but public property is assumed to be the government's responsibility and is not respected like private property (Lamzah, personal communication, Feb 12, 2019).

An interesting conversation with the professors of INAU shed additional light on the cultural implications of proposing a solution. They shared that it is important to understand what the people being impacted want rather than trying to implement something we think is best. For instance, we would not be able to build a new structure and expect the students to use it immediately. The professors stressed the importance of understanding the cultural aspect of implementing smart city initiatives in a developing country. It is important that a solution recognizes the needs of the community (Lamzah, personal communication, Feb 12, 2019).

4.3 Comparative Analysis of Focus Group and Interviews

The results from both the focus group and the interviews were analyzed using the same eight themes and the same method, both identifying connectivity as a need in Madinat Al Irfane. Both the focus group and the interviews demonstrated that infrastructure is a main problem that is negatively affecting the connectivity. Culture and education were two other themes that were mentioned as negatives that prohibit connectivity. In both the focus group and interviews, infrastructure was also minimally mentioned as a positive theme which reflects negatively for Madinat Al Irfane in achieving an interconnected environment.

Interestingly, culture was mentioned as contributing both positively and negatively to the connectivity between institutions in both the focus group as well as the interviews. This demonstrates that culture is a large part of people's lives and can be difficult to change since everyone has differing experiences and beliefs that define one's culture. Similarly, education was mentioned as both positively and negatively. Each person who was involved in this study is involved in the education within Madinat Al Irfane and therefore has a personal opinion on the theme of education in the context of connectivity.

The themes of economy and technology were not even mentioned in the focus group but had significance throughout the interviews. This may be because both themes may not be on a student's mind as they are complex and more applicable to an adult's life. Additionally, the

themes of sports and clubs were mentioned several times throughout the focus group but appeared to have little significance in the interviews. This may be because both themes directly affect the students and have little effect on the professors.

As mentioned in previous sections, a major focus of a smart city is the theme of connectivity. Each recognized theme can be remedied through the use of a connectivity initiative that will help Madinat Al Irfane become a smart city.

4.4 Results from the Survey

The team wanted to learn about the stakeholders' interest in connectivity and what initiatives would be most impactful in the community of Madinat Al Irfane from a broader audience. We did this through a survey in which we asked demographic questions, open ended questions, and used a Likert Scale scoring system.

The team received 73 total surveys, with 57 fully completed in the three weeks the survey had been live. The team disregarded surveys that were not complete. Out of these 57 completed surveys, 5 were from staff members, 1 was from a professor, and 51 were from students. Based on the limited number of responses from faculty and staff, the team decided to analyze the students' only. Figure 7 shows which institutions are attended by the students that answered the survey.

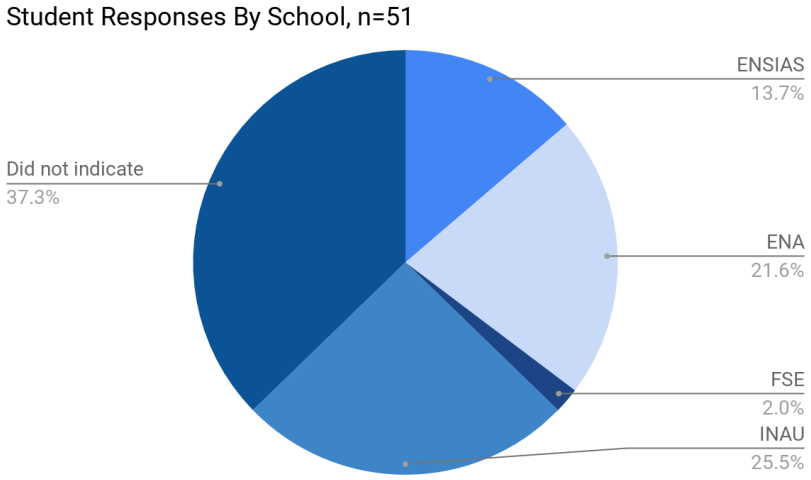

Figure 7: Composition of Students Sample by Home Institution

We used a Likert scale by which the surveyed were prompted to respond with 1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, and 5: Strongly Agree to the following statements:

1. I would like more opportunities to connect with people in schools other than mine.
2. I would participate in clubs and/or sports leagues with members of another school.
3. I would enjoy participating in a district-wide sporting event.
4. I wish there were more methods of communicating with other students
5. I would like a mobile application to notify me of events happening on campus.
6. I would like to have more common spaces to gather with friends outside of my campus.

7. I believe a centrally located library for all the schools in the district would be utilized.
8. I would utilize a sport complex open to the entire district.

The student's average response per statement was summarized and shown in Figure 8 below.

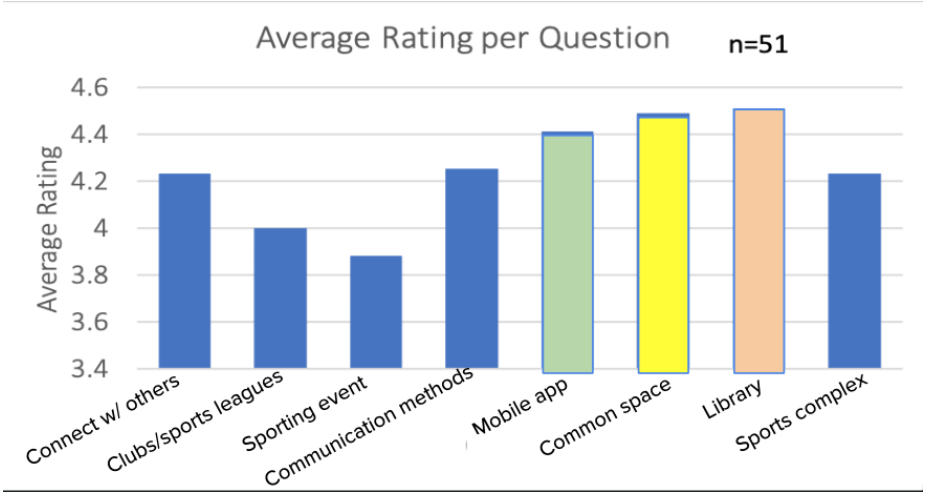

Figure 8: Average Rating per Survey Statement

Statement 5, "I would like a mobile application to notify me of events happening on campus," statement 6, "I would like to have more common spaces to gather with friends outside of my campus," and statement 7, "I believe a centrally located library for all the schools in the district would be utilized" averaged the highest on the Likert scale, showing the most "agrees" and "strongly agrees". In order to determine the statistical validity of the top three responses, a t-Test statistical analysis was performed. Statements 5 and 6 proved to be statistically equal (p value = 0.3); statements 5 and 7 proved to be statistically equal (p value = 0.4); statements 6 and 7 proved to be statistically equal (p value = 0.8). Therefore, all three top statements hold the same weight and can be considered equally important when comparing different potential solutions.

When analyzing the answers of these top three statements to interpret our data results, we found that preferences do not vary by gender. The mean answer of female students regarding the mobile application topic (mean = 4.4) was not statistically different from the mean answer of male students (mean = 4.5) (p value = .5). This was also the case with statement 6 regarding common spaces (females = 4.4, males = 4.6, p value = .5) and statement 7 regarding a centrally located library (females = 4.5, males = 4.7, p value = .6). Comparing the student responses to the staff and faculty responses, we interestingly found that "I would like to have more common spaces for members of all institutions to gather" had the highest average response between the professor and students (4.75), but had the lowest average response from the staff members (3.8). The staff and professor both rated "I would utilize a sport complex open to the entire district" high (average 4.7), whereas the students thought of it as less of an importance (4.24). The complete analysis of the survey can be found in the table in Appendix P. Since all of the statements hold the same weight, a connectivity initiative that was determined to be desirable for students was the idea of a mobile application, more common spaces, and a centrally located library.

4.5 Results of Map Analysis and Observations

We determined potential locations for a connectivity initiative using a map analysis and making observations. The map that resulted can be seen in Figure 9.

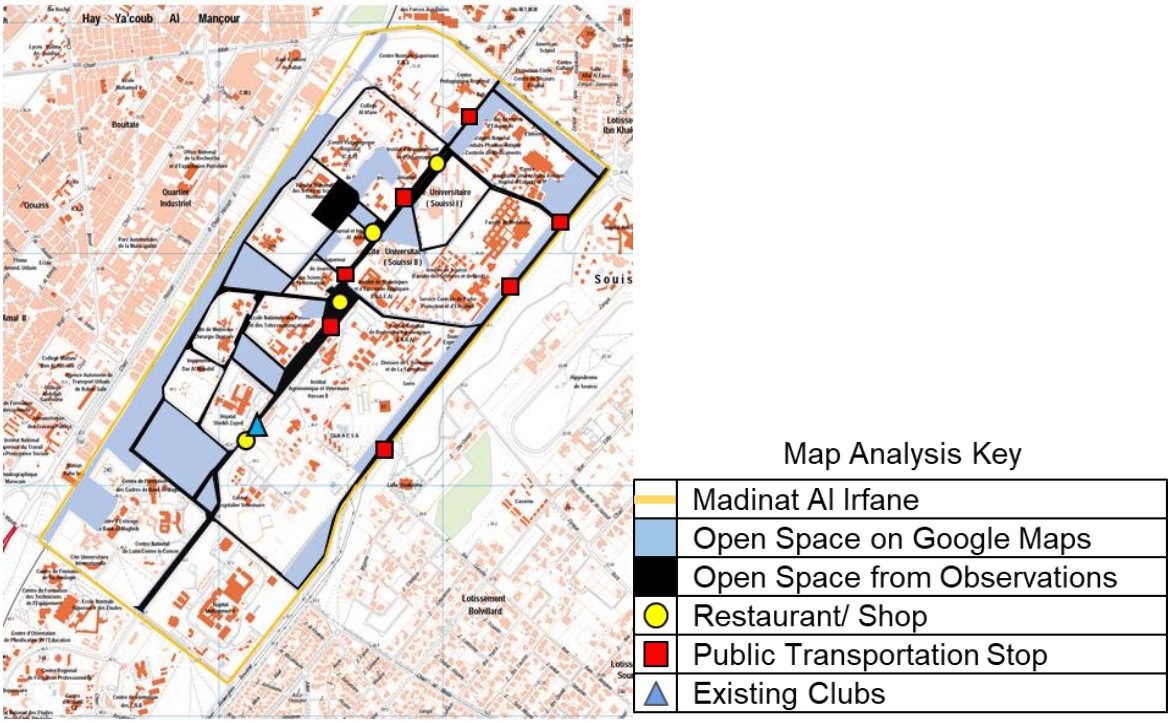

Figure 9: Map Analysis of Madinat Al Irfane

As shown in the map, the light blue space that results are the only space in Madinat Al Irfane that is not enclosed by a physical wall, determined through the map analysis. However, after doing field observations of all the areas in the light blue space, we found that the black areas are the only areas not enclosed by walls. Additionally, the various colored shapes show areas of potentially high connectivity. The colored circles are only located in areas that do not have walls surrounding them because those areas are easily accessible for members of all institutions. Since only members of a specific institution can enter into their specific campus with the current system, an easily accessible location must be located outside of a physical wall barrier. However, in the Ibn Tofail University in Kenitra, the walls between institutions were torn down around five years ago. If the walls are town down in Madinat Al Irfane, there would be more opportunity for locations for a connectivity initiative that is accessible to everyone.

Figure 10: Physical Walls Between Institutions of Madinat Al Irfane

Our analysis of the map from the City Council proved to be slightly different from our observations. In some locations, where walls were not indicated according to the map, walls actual existed and separated the area. One of the many physical walls can be seen in Figure 10. On the left side of the wall is a road with many cars and on the right side is the School of Information Sciences (EST). A person can also observe from this photo the lack of sidewalks, benches, and trash bins. The open space that resulted from the map analysis and observations are mainly roads. However, this minimal open space appeared to not be used and designed in a way that prohibited public use.

Additionally, the concept of guards at each institution entrance, learned about through the focus group, was verified through the team's observations. The gate for the entrance to one institution, ENSIAS, can be viewed in Figure 11. With guards at every entrance, only a member of that institution can enter into their campus thus creating additional obstacles for students to intermingle between different institutions.

Figure 11: Gated Entrance at ENSIAS

Another key location observed was the Market, also known as the "Campus" by residents of Madinat Al Irfane. This was one of the few circles placed in the map analysis as a place outside of any individual walled institution and is located at the center of Madinat Al Irfane. This area had convenience stores, some restaurants and appeared to be bustling with activity. It is located in between a tram stop and a public bus stop and therefore has many access points. This location has the potential for an effective connectivity initiative. A photo of this area can be seen in Figure 12.

Figure 12: Market/Campus in the Center of Madinat Al Irfane

As a result of the map analysis and the observations, it was determined that the physical walls create a physical barrier for the connectivity between institutions. A connectivity initiative would need to be located in a place where the walls are not affecting the connectivity such as outside of the walls, or where there are open gates or no walls.

4.6 Current Initiatives

Despite the challenges that Madinat Al Irfane faces, there are some aspects of connectivity that need acknowledging. Importantly, each initiative is still a part of each individual institution, so there is still opportunity for connectivity outside of the institutions and in a more informal setting. Through our focus group and interviews, we learned about some initiatives occurring in different institutions within Madinat Al Irfane that promote connectivity including collaborative spaces, academic and social competitions, and business partnerships.

Collaborative spaces provide members of individual institutions a place to meet with one another. There are libraries in each institution that are suitable for group work. Additionally, during the interview with the Entrepreneurship Center, we toured a collaboration space that is being built with large, open tables.

We also learned about different **academic and social competitions.** A Hackathon is one academic competition that challenges students to come up with smart city ideas for Madinat Al Irfane, similar to this project. This competition involves the entire Madinat Al Irfane and therefore connects students from different institutions. Other social competitions exist through sports and gaming. During our focus group, the students informed us about an event, similar to a field day, that each institution hosts individually and invites other institutions to. It allows students to intermingle and compete for their own institution. The students were excited to discuss this event and expressed interest in seeing more events that are similar.

Forum GENI Enterprises, the club that helped us with our focus group, demonstrates an example of an initiative that involves **business partnerships**. This club involves four different institutions

and holds a career fair for the institutions where companies can come to the campus and talk with the students about potential internship, job and research opportunities.

Additionally, there is an organization called SMARTi Lab, located near Madinat Al Irfane, that is consisted of teams of inventors, doctors, PHD students, engineers, associate professors, high-qualified technicians and students. They have completed 8 projects and their mission is to "offer a complete range of inventions for a better life" (Daissaoui, 2019). They seek to be capable of meeting future challenges to society while being socially responsible in the process and provide many services such as determining if a project will be successful, meeting client needs in their field of study for research and prototyping, and partnerships for internships.

These are examples of connectivity that appear to be successful and have the potential to be a implemented more in Madinat Al Irfane. While all of these initiatives promote an aspect of a smart city in Madinat Al Irfane, there is opportunity for more connectivity between institutions. When all of the universities are connected and collaborating together, they can work together to enhance the area as a whole. Through a connected community, the ideas of a smart city can be achieved to create a better overall quality of life.

4.7 Discussion

Through the data collection method of a focus group, the team was able to understand the lack of connectivity between institutions from a student's perspective and learned that the students seek interconnection with others outside of their campus. However, they lack the means for doing so. Our survey results confirmed this, as the most respondents agreed with the statement of "I would like to have more common spaces to gather with friends outside of my campus". The survey results also displayed that the students desire a centrally located library for all of the institutions in Madinat Al Irfane. The interviews with experts of smart city research explained that culture, education, and infrastructure must be taken into account when proposing a connectivity initiative. Finally, our map analysis and observations revealed a location for potential connectivity initiatives.

Many of our survey results aligned with the focus group and interview analysis results. For instance, the infrastructure and culture of Madinat Al Irfane appears to be the biggest challenge to connectivity and may prohibit growth in becoming a smart city. Through the coding of the focus group and interviews, this was explicitly shown as the highest percentages contributing towards negative aspects of connectivity between institutions. This was again validated in the survey when many students selected the option to show their desire for more common spaces. We combined our plans for a location of a connectivity initiative with the need for better infrastructure with an educational and cultural vision in mind to use towards a smart city initiative. The theme of infrastructure is an integral part of a city and a lack of proper infrastructure limits the connectivity between members and may prohibit growth for a smart city. This section provided analysis of the evidence collected upon which to base our recommendation for a connectivity initiative that can facilitate the creation of a smart city.

5.0 Recommendations and Conclusion

This section integrates the results from the focus group, interviews, survey, and observations to provide recommendations to create a connected Madinat Al Irfane. After completing our objectives, the team made recommendations to interconnect the community and enhance the quality of life for the main stakeholders of Madinat Al Irfane.

5.1 Recommendations for a Connectivity Initiative

Based on our findings, we recommend various different connectivity initiatives to be implemented:

1. **Centrally located multimedia space**
2. **Outdoor seating areas**
3. **Increased number of competitions**
4. **Website for research information**
5. **Social committee**

First, a centrally located multimedia space that is open to members of all institutions would interconnect the community of Madinat Al Irfane by providing a common space to gather, socialize, and study. This space would eliminate the problem of students not having a place to meet students from other institutions and the student's feeling that there is nowhere for them to go outside of their own individual campuses. Ideally, this space will have a subsidized and well stocked cafeteria to provide students with another option for meals and snacks. This multimedia space could be located in various unbuilt spaces, even spaces that are surrounded by walls. For example, the large sports field we observed, or the Equestrian Club found in our map analysis both have the potential to be a location for this connectivity initiative. More information regarding the legal rights to the property would need to be sorted out prior to building on these sites.

Second, we would like to recommend adding outdoor seating areas in the open spaces between institutions and roads. According to the data collected in our map analysis and observations, the main space that is accessible for all members of Madinat Al Irfane is along the roads. The only park bench that was located outside of a walled area was filled with students sitting and socializing. Outdoor seating areas would provide a space for meeting outside of individual campuses. With more seating areas located outside of the physical walls, people may begin to gather outside of their institutions, ultimately leading to more connectivity. Outdoor seating areas can be located anywhere throughout Madinat Al Irfane in the black highlighted area shown in Appendix I, to ensure that anyone can access and utilize them.

Third, more competitions among institutions can create a more interconnected community. There are many competitions that already exist within each institution, as learned through our focus group and interviews. Each competition is very entertaining for the students and gives the students a reason to work together towards a common goal. However, we only learned of the one, Hackathon, that is comprised of multiple institutions. Competitions that encourage teams made up of students from varying institutions can promote interconnection. These competitions may range from anything like academics, sports, games or trivia. Each institution can host a

competition every month, opening their doors to members of other institutions to promote collaboration.

Fourth, a website can be created to hold information regarding research conducted by the different institutions. When interviewing professors with backgrounds in smart city research, many recognized the fact that there were other professors completing research in similar fields, but there was no method of communication between them. Professor Bah of EMI recommended the creation of a website with detailed information on the type of research being done, the members of each team, contact information, and the fields of study that are involved. This website can provide a platform for collaboration between research teams and can provide an opportunity for students and businesses alike to learn about ongoing research and seek involvement and collaboration.

Lastly, a committee comprised of members from each institution can plan social events for all students to participate in. In our focus group, we learned that there are clubs in each institution that put on events for their individual institution. A committee that connects all of these clubs and merges them together would provide an opportunity for further connectivity. In Ibn Tofail University, student clubs involve the entire university population, not individual institutions. Ibn Tofail University hosts community events and services like speakers and conferences. Both Rhodes University and Portland State University, mentioned previously in Section 2, have enacted committees that are in charge of organizing events and connecting students together. A committee in Madinat Al Irfane that is comprised of multiple institutions can organize similar events as these universities which would provide a method for individuals to work together. This committee would give students a sense of ownership for the development of Madinat Al Irfane and provide students a chance to work together.

As learned through an expert interview, the land outside of each individual institution is thought of as public property. For the implementation of a physical solution to be successfully utilized, it would need to be created by the government of Madinat Al Irfane to ensure that members of all institutions feel an equal sense of ownership.

The implementation of these five recommendations will provide members of the institutions multiple physical locations to gather, methods for connecting, and the means for collaborating. Each recommendation is validated from the comparative analysis of the results from our three objectives.

5.2 Opportunities for the future

During our project, we were able to obtain an understanding of the connectivity between institutions within Madinat Al Irfane. However, we recognize that our understanding was based off of members of institutions and may not be reflective of all individuals within this area. Therefore, we have a few recommendations for future research.

The people who participated in our focus group were a part of an organization that connects multiple institutions together. That being said, the participants are already interested in connectivity and therefore, may not equally represent the thoughts of every person in Madinat Al

Irfane. In the future, a focus group can be held with students, professors, and administrative staff so that every group of stakeholders is spoken for. The group's preliminary understanding of the problem was based off of opinions of the students, but because the staff and faculty were not easy to receive data from, our recommendations mainly consider the students.

We created a survey in order to understand the perspective of a larger audience and poll this audience on connectivity initiatives. There were three main institutions who completed the survey and so it was not entirely reflective of all individuals of Madinat Al Irfane. In a future project, if a survey is created, we recommend that the team first seek contacts in all of the institutions and send the survey through the contacts. This will allow more evenly distributed responses from all institutions.

There are many physical and social aspects that can affect the feasibility of a solution. In order to understand these aspects and validate our work, we consulted experts and observed some implementations of connectivity initiatives in the Ibn Tofail University in Kenitra. This allowed us to understand the feasible solutions of what actually can be done given the local culture. An approach similar to this is recommended for future research.

A smart city is a very complex idea and because of a time constraint, we focused on one aspect of a smart city, connectivity. The ideas from this project and those from a similar project completed last year are building blocks for Madinat Al Irfane and serve as guidance for government officials to implement. The team proposed a solution but the process for actual change requires time and resources.

5.3 Concluding Remarks

While the ideas of a smart city are difficult to implement, there are many positives that a smart city can bring to a community. Connectivity initiatives have proven to be successfully implemented in Ibn Tofail University, and therefore similar ideas can be implemented in Madinat Al Irfane. From our data collection, we concluded that a multimedia space, outdoor seating area, more intercollegiate competitions, a website for research information and a social committee are some options that provide members of institutions a method of connecting with one another. This enhanced connectivity ultimately promote further innovation and a better quality of life. Both recommendations will enhance the current state of the connectivity between the institutions of Madinat Al Irfane.

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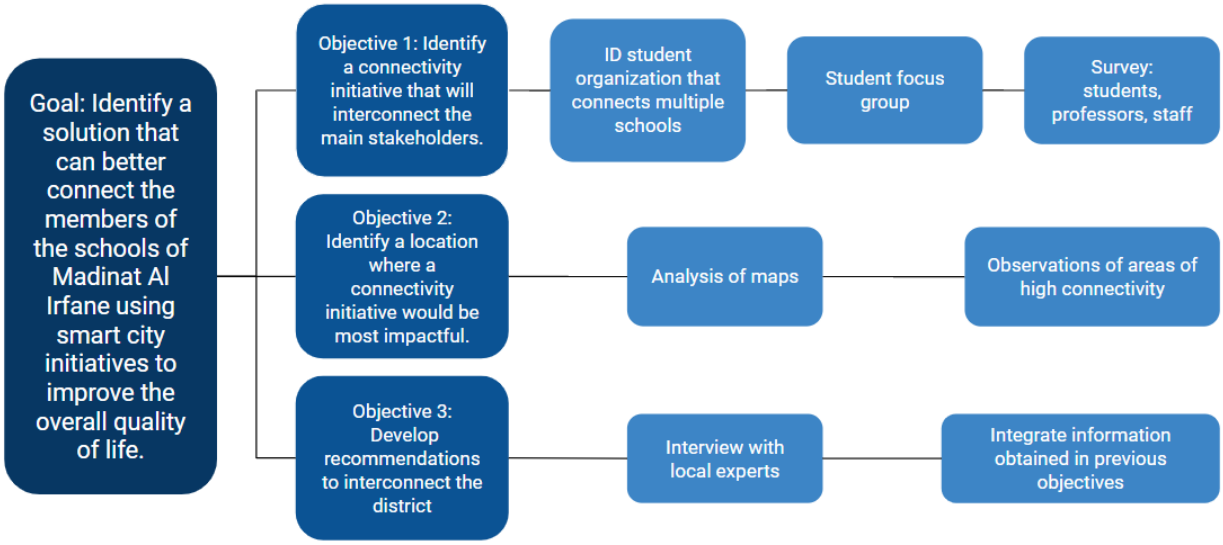
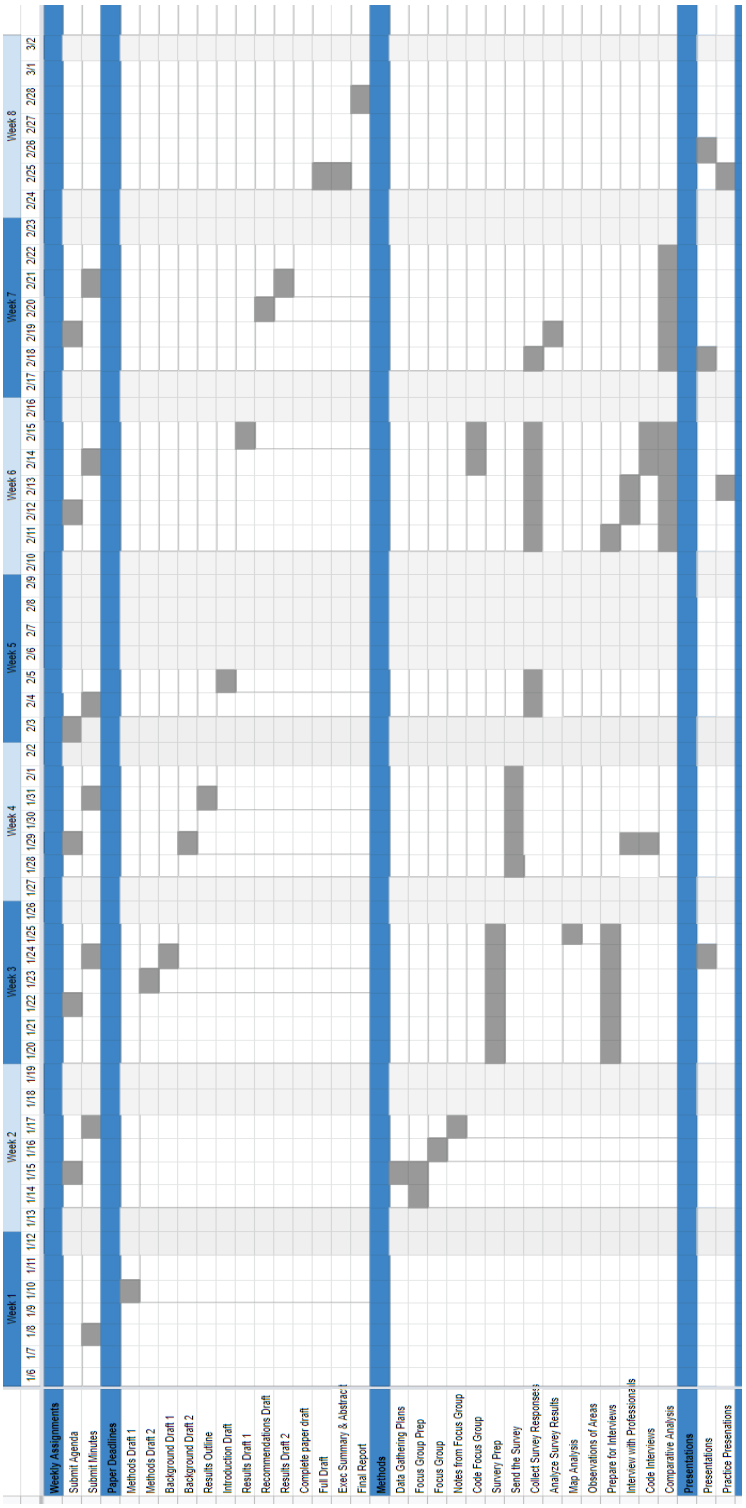
Appendix A: Methodology Flow Chart



Appendix B: Gantt Chart



Appendix C: Consent Form for Focus Group

Informed Consent - Student's Opinions

Purpose

This study investigates the students' opinions on the connectivity between schools within the district of Madinat Al Irfane. As part of this study, you will be asked to participate in a focus group and answer structured and open-ended questions. This study will take approximately 45 minutes.

Participants' Rights

I understand that my responses will be kept in the strictest of confidence and will be available only to the researcher. No one will be able to identify me when the results are reported and my name will not appear anywhere in the written report. Please do not share other people's identities or responses from the focus group with others to maintain the anonymity of the participants outside of the focus group. I also understand that I may skip any questions or tasks that I do not wish to answer or complete. I understand that the consent form will be kept separate from the data records to ensure confidentiality. I may choose not to participate or withdraw at any time during the study without penalty.

Consent to be Recorded

I agree to have my verbal responses tape-recorded and transcribed for further analysis with the understanding that my responses will not be linked to me personally in any way. After the transcription is completed, the tape recordings will be destroyed.

Consent to Participate

I acknowledge that I am at least eighteen years old, and that I understand my rights as a research participant as outlined above. I acknowledge that my participation is fully voluntary.

Print Name: _____

Signature: _____ Date: _____

Appendix D: Institutional Review Board (IRB) Approval

WORCESTER POLYTECHNIC INSTITUTE

100 INSTITUTE ROAD, WORCESTER MA 01609 USA

Institutional Review Board
FWA #00015024 - HHS #00007374

Notification of IRB Approval

Date:	10-Jan-2019
PI:	El-Korchi, Tahar
Protocol Number:	IRB-19-0282
Protocol Title:	Smart City Rabat
Approved Study Personnel:	Elice, Sarah~Stahl, Jordan~Graveline, Elizabeth~El-Korchi, Tahar~Miller, Fabienne~
Effective Date:	10-Jan-2019
Exemption Category:	2
Sponsor*:	

The WPI Institutional Review Board (IRB) has reviewed the materials submitted with regard to the above-mentioned protocol. We have determined that this research is exempt from further IRB review under 45 CFR § 46.101 (b) (2), which applies to

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

The study is approved indefinitely unless terminated sooner (in writing) by yourself or the WPI IRB. Amendments or changes to the research that might alter this specific approval must be submitted to the WPI IRB for review and may require a full IRB application in order for the research to continue. You are also required to report any adverse events with regard to your study subjects or their data.

Changes to the research which might affect its exempt status must be submitted to the WPI IRB for review and approval before such changes are put into practice. A full IRB application may be required in order for the research to continue.

Please contact the IRB at irb@wpi.edu if you have any questions.

*if blank, the IRB has not reviewed any funding proposal for this protocol

Appendix E: Discussion with Focus Group Outline

Outline:

1. Welcome
    a. Welcome students, thank them for coming, introduce ourselves, inform them of our project & the goal of the focus group, hand out consent forms to be signed
        i. Goal: Identify factors that promote an interconnected campus
        ii. Short Summary: Our project is to identify the weakest aspect of connectivity in Madinat Al Irfane. We want to determine aspects of the campus that can realistically be improved.
        iii. Definition of smart city: smart city is a city that is able to use technology and innovation to interconnect the population in order to improve the wellbeing of its citizens.
2. Ice Breaker
    a. Ask if participants know each other
    b. Ask participants to introduce themselves, what they're studying, their age, their favorite restaurant around Madinat Al Irfane
3. Questions
    a. Where on campus do you get together with friends?
        - Is it a daily thing, weekly?
    b. What kinds of services are provided in your school that help promote collaboration? creativity?
        i. Extracurricular
        ii. academics
    c. Is it common for students to interact with others outside of their specific school?
    d. What is your opinion on meeting students from other schools?
    e. Our school has a program where we go to study in a different country and we are placed in a group with students of all different majors and disciplines. Is something like this interesting to you?
    f. What do you think can be done to interconnect the campus?
    g. Do the walls on the campus seem to prohibit any interconnection?
    h. We were told there was a sports tournament throughout the campus. Can someone tell us a little bit more about that?
        - Is this very popular? Would people want to do this more often?
    i. Have you ever wanted to take classes at other schools but weren't able to?

Appendix F: Survey Questions for Students, Professors and Staff

Hello! We are a team of college students from Worcester Polytechnic Institute in the United States. We are looking to understand the current state of connectivity within the area of Madinat Al Irfane in partnership with ENSIAS at Mohammed V University and the government of the district of Agdal Ryad, Conseil de L'Arrondissement Agdal-Ryad. The information received through this survey will be used to propose an area of improvement within the district that can promote a more interconnected community using smart connectivity. Smart connectivity is the use of innovation and technology to bring together a group of people in order to improve their quality of life. We will ask ten questions that will take approximately ten minutes in total.

Your participation is voluntary. If you decide to take the survey and at any point wish to withdraw, you are able to do so. You may skip any questions that make you feel uncomfortable. Your survey answers will be confidential and are strictly for research purposes. The answers received will never be correlated to the respondent of this survey.

Thank you for your time and support in our project!

Salut! Nous sommes une équipe d'étudiants du Worcester Polytechnic Institute aux États-Unis. Nous cherchons à comprendre l'état actuel de la connectivité dans la région de Madinat Al Irfane en partenariat avec l'ENSIAS de l'Université Mohammed V et le gouvernement du district d'Agdal Ryad du Conseil de l'Arrondissement Agdal-Ryad. Les informations reçues dans le cadre de cette enquête serviront à proposer un domaine d'amélioration au sein du district susceptible de promouvoir une communauté plus interconnectée grâce à la connectivité intelligente. La connectivité intelligente consiste à utiliser l'innovation et la technologie pour réunir un groupe de personnes afin d'améliorer leur qualité de vie. Nous poserons dix questions qui prendront environ dix minutes au total.

Votre participation est volontaire. Si vous décidez de participer au sondage et souhaitez à tout moment vous retirer, vous pouvez le faire. Vous pouvez sauter des questions qui vous mettent mal à l'aise. Vos réponses au sondage seront confidentielles et strictement à des fins de recherche. Les réponses reçues ne seront jamais corrélées avec le répondant de cette enquête.

Merci pour votre temps et votre soutien dans notre projet!

I. About Yourself

1. What is your gender?
   Quel est votre sexe?
   1. Male *Homme*
   2. Female *Femme*
   3. Other *Autre*
2. Which of the following best describes you?
   Lequel des énoncés suivants vous décrit?

1. Student *Étudiant(e)*
2. Professor *Professeur*
3. Staff Member *Employé(e)*
4. Other *Autre*

3. (Faculty and Staff) At which institution do you work? (students) Which institution do you attend?
   (Faculty and Staff) *Dans quelle institution travaillez-vous?* (Students) *Quelle institution fréquentez-vous?*
4. (Faculty and Staff) How long have you been working in Madinat Al Irfane?
   (Faculty and Staff) *Depuis combien de temps travaillez-vous à Madinat Al Irfane?*
   (Student) How long have you been a student in Madinat Al Irfane?
   (Student) *Depuis combien de temps étudiez-vous à Madinat Al Irfane?*
   1. Less than 1 year *Moins de 1 an*
   2. 1-2 years *1-2 ans*
   3. 2-4 years 2-4 ans
   4. 5+ years *5+ ans*
5. (Faculty and Staff) In which of the following do you live while working in Madinat Al Irfane?
   (Faculty and Staff) *Dans lequel des domaines suivants habitez-vous à Madinat Al Irfane?*
   1. A house in Madinat Al Irfane *Une maison à Madinat Al Irfane*
   2. An apartment in Madinat Al Irfane *Un appartement à Madinat Al Irfane*
   3. Outside of Madinat Al Irfane. Where? *En dehors de Madinat Al Irfane. Où?*

   (Student) In which of the following do you live while at school?
   (Student) *Dans lequel des domaines suivants habitez-vous à l'école?*
   1. A dorm in Madinat Al Irfane. *Un dortoir à Madinat Al Irfane.*
   2. An apartment in Madinat Al Irfane. *Un appartement à Madinat Al Irfane.*
   3. Outside of Madinat Al Irfane. Where? *En dehors de Madinat Al Irfane. Où?*
6. What city are you originally from?
   Quelle est votre ville d'origine?
   1. Agadir
   2. Casablanca
   3. Essaouira
   4. Fes
   5. Marrakech
   6. Meknes
   7. Rabat
   8. Tangier
   9. Other *Autre*

II. Please fill in your response to the following questions:

1. (Faculty) What is one place, outside of the classroom but within Madinat Al Irfane, you meet with fellow colleagues?
   Où, un seul endroit, vous rencontrez vos collègues en dehors des classes et au sein de Madiant Alirfane?
   (Students) What is one place, outside of the classroom but within Madinat Al Irfane, you meet with fellow students?
   Où, un seul endroit, vous rencontrez vos collègues les étudiants en dehors des classes et au sein de Madiant Alirfane?
2. How often?
   À quelle fréquence?
   1. Daily *Quotidiennement*
   2. 4-6 times a week *4-6 fois par semaine*
   3. 2-3 times a week *2-3 fois par semaine*
   4. Once a week *Une fois par semaine*
   5. Never *Jamais*
3. In your opinion, what is the busiest place within Madinat Al Irfane?
   A votre avis, quel est l'endroit le plus fréquenté à Madinat Al Irfane?

III. Opinion Spectrum:

Please indicate whether you agree or disagree with the following statements.
Veuillez indiquer si vous êtes d'accord ou non avec les affirmations suivantes.
(Students)

1. I would like more opportunities to connect with people in schools other than mine.
   Je voudrais plus d'opportunités d'entrer en contact avec des personnes dans des écoles autres que la mienne.
2. I would participate in clubs and/or sports leagues with members of another school.
   Je participerais à des clubs et / ou à des ligues sportives avec des membres d'une autre école.
3. I would enjoy participating in a district-wide sporting event.
   J'aimerais participer à un événement sportif de tout le district.
4. I wish there were more methods of communicating with other students.
   J'aimerais qu'il y ait plus de méthodes de communication avec les autres étudiants.
5. I would like a mobile application to notify me of events happening on campus.
   J'aimerais qu'une application mobile me prévienne des événements survenus sur le campus.

6. I would like to have more common spaces to gather with friends outside of my campus.
   J'aimerais avoir plus d'espaces communs pour rencontrer des amis en dehors de mon campus.
7. I believe a centrally located library for all the schools in the district would be utilized.
   Je crois qu'une bibliothèque centrale pour toutes les écoles du district serait bénéfique.
8. I would utilize a sports complex open to the entire district.
   J'utiliserais un complexe sportif ouvert à tout le district.

(Faculty)

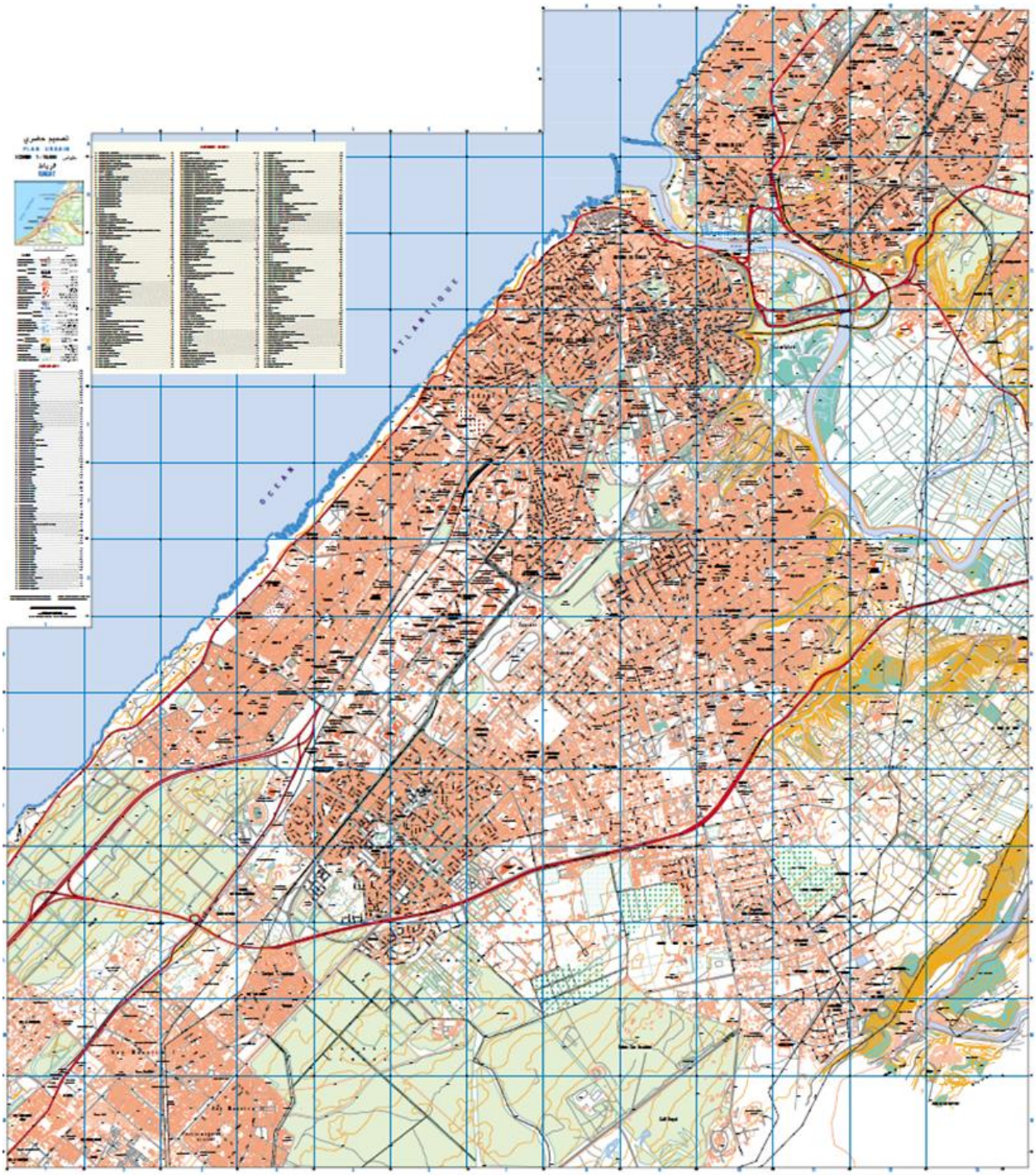
1. I would like more opportunities to connect with people in schools other than mine.
   Je voudrais plus d'opportunités d'entrer en contact avec des personnes dans des écoles autres que la mienne.
2. I would like to participate in research with members of other schools.
   J'aimerais participer à des recherches avec des membres d'autres écoles.
3. I wish there were more methods of communicating with other faculty members.
   J'aimerais voir plus de méthodes de communication avec les autres membres du corps professoral.
4. I would utilize a mobile application that notifies me of events happening on campus.
   Je voudrais utiliser une application mobile qui me notifie des événements se produisant sur le campus.
5. I would like to have more common spaces for members of all schools to gather.
   J'aimerais avoir plus d'espaces communs pour les membres de toutes les écoles.
6. I believe a centrally located library for all the schools in the district would be utilized.
   Je crois qu'une bibliothèque centrale pour toutes les écoles du district serait bénéfique.
7. I would utilize a sport complex open to the entire district.
   J'utiliserais un complexe sportif ouvert à tout le district.

(Staff/ Other)

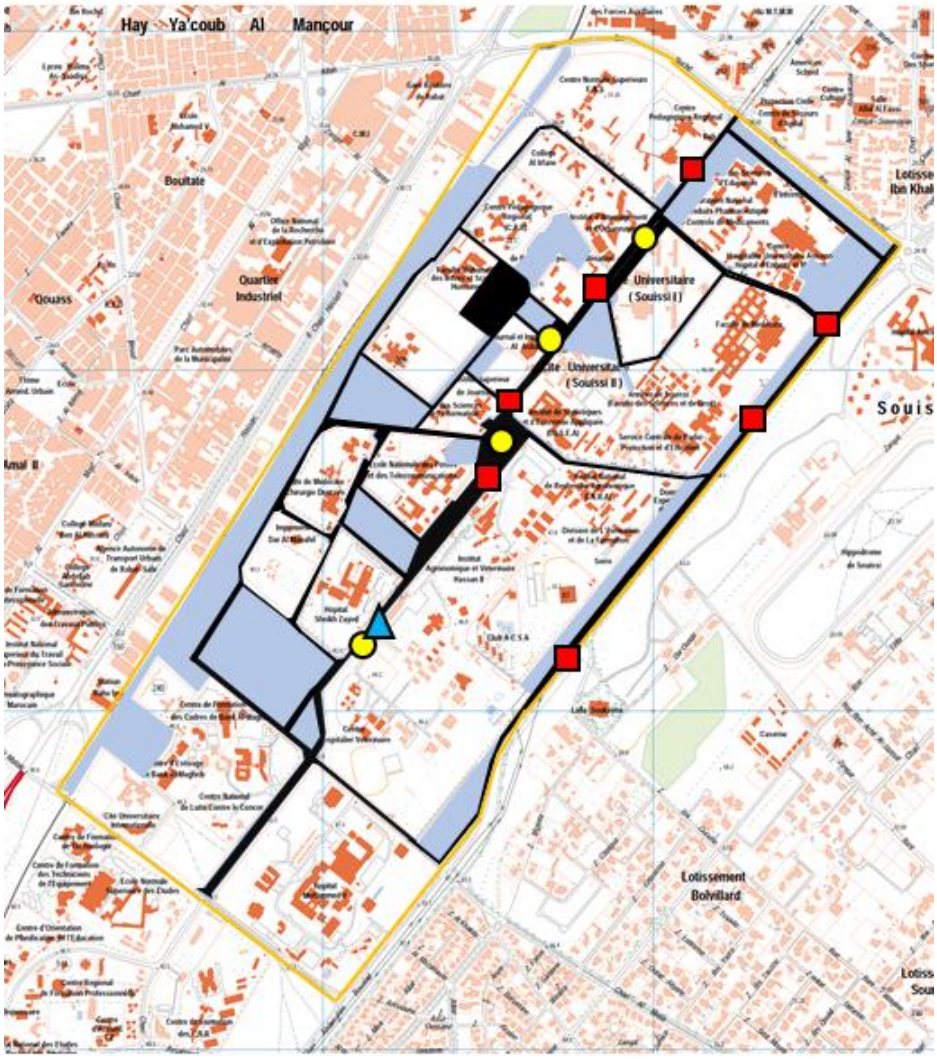
1. I wish there were more methods of communicating with other staff members.
   J'aimerais qu'il y ait plus de méthodes de communication avec les autres membres du personnel.
2. I would utilize a mobile application that notifies me of events happening on campus.
   Je voudrais utiliser une application mobile qui me notifie des événements se produisant sur le campus.

3. I would like to have more common spaces for members of all schools to gather.
   J'aimerais avoir plus d'espaces communs pour les membres de toutes les écoles.
4. I believe a centrally located library for all the schools in the district would be utilized.
   Je crois qu'une bibliothèque centrale pour toutes les écoles du district serait utilisée.
5. I would utilize a sports complex open to the entire district.
   J'utiliserais un complexe sportif ouvert à tout le district.

Appendix G: Map of Rabat



Appendix H: Non-walled areas in Madinat Al Irfane



Madinat Al Irfane was outlined in yellow, areas not located inside individual school walls were shaded blue, and potential areas of connectivity unrestricted by walls were pinpointed. Pinpoints include red squares representing public transportation stops, yellow circles representing restaurants and shops, and a blue triangle that represents an existing club. The area in black includes our observations to validate areas that are not surrounded by walls and open to any student.

Appendix I: Consent Form for Interviews

Informed Consent - Opinion of Person Being Interviewed

Purpose

This study investigates the opinion of the people being interviewed on the role of connectivity between schools within the district of Madinat Al Irfane. As part of this study, you will be asked a series of questions. The interview will take approximately 30 minutes.

Participants' Rights

I understand that my responses will be kept in the strictest of confidence and will be available only to the researcher. No one will be able to identify me when the results are reported and my name will not appear anywhere in the written report. Please do not share other people's identities or responses from the focus group with others to maintain the anonymity of the participants outside of the focus group. I also understand that I may skip any questions or tasks that I do not wish to answer or complete. I understand that the consent form will be kept separate from the data records to ensure confidentiality. I may choose not to participate or withdraw at any time during the study without penalty.

Consent to be Recorded

I agree to have my verbal responses tape-recorded and transcribed for further analysis with the understanding that my responses will not be linked to me personally in any way. After the transcription is completed, the tape recordings will be destroyed.

Consent to Participate

I acknowledge that I am at least eighteen years old, and that I understand my rights as a research participant as outlined above. I acknowledge that my participation is fully voluntary.

Print Name: _____

Signature: _____ Date: _____

Appendix J: Questions for Interviews with Professionals

I. Explain our project objectives and goals, summarize the project, and discuss our definition of a smart city.

II. The idea of a smart city is constantly changing with new literature being published. What is your definition of a smart city?

III. We held a focus group in order to understand students opinions, but the main purpose of this interview is to understand perspectives of professionals as well. What is one main aspect you think the city of Rabat as a whole is lacking in becoming a smart city?
   - We are studying smart city implementations on a smaller scale since we are only here for seven weeks. Do you know about Madinat Al Irfane? If so, what do you think could be improved on their campus to enhance the aspect of collaboration and connectivity?

IV. When we were talking to the students, they mentioned a lack of progression at the university. Do you see this in the professional world for the city of Rabat as a whole?
   - What can be done about this?

V. Do you see a lack of connectivity in the professional world?

VI. While we were doing research and when we arrived on campus, we noticed the physical walls separating different campuses. Do the walls on the campus seem to prohibit any interconnection?

VII. We commute to Madinat Al Irfane everyday with the tram system. Do you think this form of transportation is being utilized by the students, or could utilizing it help interconnect other parts of campus?

VIII. When talking to the students about common spaces, they showed great interest. Do you think long term it could be realistic to create that space students say are lacking? If not, what are the obstacles?

Appendix K: Defined Themes for Coding

Theme	Code	Pattern	Definition
Sports			An aspect where physical activity involves multiple people.
Clubs			An aspect where organizations join members of schools together.
Media			An aspect that includes websites, social media, or any main form of communication.
Education			An aspect that involves research collaboration, group work, or connecting for educational purposes.
Economy			An aspect that enhances buisness and school collaboration.
Infrastructure			An aspect that involves physical, public spaces.
Culture			An aspect that involves religion, people's way of life, or upbringing.
Technology			An aspect that involves a technological aspect that does not include media.

Appendix L: Coded Focus Group Discussion

The Focus Group took place at ENSIAS on January, 16th at 7pm. There were 8 students that were organized by an association called Forem GENI. Before the meeting, the group discussed topics and formed questions to keep the conversation going. During the session, Liz was chair while Jordan and Sarah were secretaries. The focus group was held in a classroom that the club would traditionally meet in. Before the meeting started, we asked the students to read and sign the consent form, found in Appendix B. When it started, we asked the students to introduce themselves with their name, age, major, year in school, and their favorite place to eat in Madinat Al Irfane. From this, we were able to see the students were in between the ages of 20-22, from a variety of majors, and they were all second-year students. The following questions were asked during the focus group and the student's responses are summarized.

1. Where on the ENSIAS campus do people get together with friends?

From asking this question, we were able to determine locations that students hang out. Their response was initially that it depends on the student. We noticed that their cafeteria is always full. It seems to be the spot to socialize because it allows students to eat and interact as well as play pool. One student said he likes to play pool so he spends his time hanging out around a pool table with friends. Another student said they like to go out of school and get away from the environment they study in. Another student mentioned that it is a hassle to go off campus go to a café or somewhere else with students and/or friends from other schools. At ENSIAS, the students get together in dorm rooms because they all live on campus. This question was hard to answer though because the students said with all the work they do, there is not a lot of free time for students to get together from other schools and even other campuses.

2. What kinds of services provided to help promote collaboration and creativity?

The students all said there are lots of clubs on campus. They are mainly focused on activities related to IT and electronics with some related to arts and music. Each school has their own separate clubs and activities that only involve the students attending. There is one club that the students said is a committee that organizes events specific to each school. Each school has a committee that helps organize a big event that happens in March for ENSIAS. The other schools have different times to host the event, but all students from other schools are welcome. This is a great way to get together for all schools in Madinat Al Irfane, it is a sporting event that includes competitions of football, basketball, etc. The students informed us that lots of kids from other schools come to it and were very enthusiastic to talk about it. They really enjoyed the competitive aspect of the sporting event and look forward to it every year. After hearing about that it only occurs once a year, we asked if they would be interested in making that event more frequent, or creating other events where friendly competition between schools could occur. The students were very excited and interested in making it more often. From there we asked if it was common for students to meet other students outside of their respective schools. The students responded saying it is possible but most people meet the other students from before coming to

college. We also learned that the activities the students partake in during their first year are the kick start to their social life. Students really rely on their campus to socialize with others. One student told us about a presentation for each club to advertise themselves. This takes place the first 2 weeks of school and it is called integration week. The students hear about clubs through club presentations, word of mouth, and Facebook. This is a rare time that students have a lot of free time to get involved in the clubs they are interested in.

3. Is it common for students to interact with one another outside of a specific school?

From what the students said, it is not common to interact with students outside their schools. They said any interaction with students outside of their specific schools is only with people who have been in their lives prior to choosing a major. From this, we were a bit confused because we did not understand the Morocco school system. One of the students explained that before students go to their respective university and study what they want, there are 2 years of preparatory classes where kids mix with all different interests. After that, there is a big test which is similar to the SAT's and ACT's. From there, everyone chooses a major and applies to schools within a university. Unfortunately, they informed us that students rarely meet new people outside of their individual schools once they start attending them.

4. Would you want to meet new people?

The students were very excited about our question. They instantly said yes but then explained that people mainly stick with their own school because there is a lot of school pride. The school becomes like your family and the school becomes a part of you. A student spoke up and talked about how talking with friends from other schools, a student would never state their own school is better without starting an argument. For instance, the people in one school may talk a lot about the bad things about their own school, but if someone from a different school were to come, they would only talk about the good because of how much pride everyone has for the school they attend. The students feel the need to defend their own schools because it becomes their family. From that news, we asked if there was any interest in becoming more connected and a student mentioned that there is a desire to stop the rivalry.

5. Is there any sports league between schools or just in ENSIAS?

Since the students got so excited about the friendly competition through sports, we asked if there was any between other schools on a regular basis. They said no it stays within the school, but there are other leagues at other schools. This creates a competitive atmosphere between schools.

6. Our school has a program where we go to a different country with a team of different majors, would you want to do something like that?

We wanted to get their insight on traveling abroad since we are spending time abroad in their country. The students were very interested. One specifically said
that more exchange programs would be nice but they are very rare in their school. She said that only around 10 students per school get to study abroad, and it is only to further their studies and not complete a project. From asking this question, the students wanted to know why we chose Morocco. We explained the project requirement and what an IQP was. They were very intrigued

by the idea of the IQP because there is no such opportunity for them. The students showed interest in going outside of their comfort zones.

7. If there were programs that interconnected schools how would you feel?

The students were hesitant about this topic because there is a lot of competition between the schools. Someone then mentioned that maybe the competition between schools would diminish with more opportunities to connect with other students of different schools. The students from there talked about having a more friendly and interconnected area with it acting like one home rather than each school being its own home.

8. What is the purpose of all the walls?

When we got to Morocco and saw all the walls, we were curious to see what the students had to say about them. The students simply said it is for security, but some people disagreed with that statement. The idea of an open campus is so foreign to them because they understand how it would work. It has always been separated for them so it is what they know. One student mentioned how their parents used to meet people from different schools. They would go to a cafe and meet up with their friends from different schools. This is not the case for the current students, but they were unsure why it changed. This concept faded long ago, but the current students would be interested in bringing it back. We were informed that the campus has not changed since all of their parents attended the universities. There is a lack of physical change even though the current students' interests are different than past generations. This may be the reason why students no longer get together with kids outside of their schools. We were also told that when their parents' generation attended the university, there was a market that all of them used to hang out in. The current students have no interest in hanging out in the market because there is nothing fun to do there and they consider it old school. For them, the market is a place to buy food and not hang out. Lastly, the students talked about the opportunity to study outside of their major, or lack thereof. If a student wanted to subject outside of their major, they would just ask their friends to teach them because it is not possible to take a course in a subject outside of their major.

9. What do you find fun?

We asked the students what they like to do in their free time and what they find fun to gain perspective of possible solutions. One student mentioned the need for a place to read and relax. Another student mentioned having a pool table or arcade with games. Some other students expressed interest in having gaming competitions. From there, a student mentioned that the Japanese club used to do it, or still does hold competitions but it is not regularly. This student was interested in a place to meet with their teams for an online gaming contest. As a whole, the students expressed interest in competing against other schools in gaming teams. There was lots of interest in becoming more familiar with new faces.

10. What type of place would you hang out in?

After figuring out what the students were interested in, we asked what space they would like to have. The students said if there was a space that had a coffee shop like Starbucks and a library combined. They would like a place to hang out, study, and sip coffee. Their current study spaces

are classrooms so a student mentioned that it feels like they're in classes forever. They have no interest in going to the same place to do work as they learn. We asked about a library on campus and were informed that there is a small library that closes at 3 pm and has the most inconvenient hours. The students also said the books there are not interesting because they are all academic. We asked if they had any interest in the National Library that was not on their campus. In order to get there, the students have to take the tram. The students did not like the idea of utilizing that space because it is too far and a huge hassle to get there. They also did not like the idea of bringing everything with them and if they were to forget something then it would be a huge inconvenience. The students also objected using a library space because it would be too crowded during exam times.

11. New space?

We asked if there was any place on campus that would allow new space to be developed for students to hang out and be able to collaborate. For example, an old building to renovate or an empty lot that is not being utilized. The students said there are no spaces or old buildings that they could see changes. They said there would have to be a new building if they wanted an open space to meet.

13. Have you ever wanted to take classes at other schools but not able to?

We were curious to see if students even had an interest in taking classes with other majors. Unfortunately, we were informed that classes are not a choice. Unlike our curriculum at WPI, their entire schedule is predetermined for them based on their major. A student talked about if they had the choice to take classes, a lot of the classes they currently have to take they wouldn't. We talked a little about how our classes and schedules allow a lot of freedom and the students loved the idea of being able to choose classes to take.

14. What other classes would you like to take?

We were curious to see what the students found interesting. The students started listing off studies like philosophy, psychology, and different languages. From there we discussed how their culture consists of three languages. This was interesting to us because we only know one. For the students, Arabic is their mother language. They had to learn French in school and then later on in their schooling, they learn English. We were surprised to hear that learning languages to them is not a choice because they had to take them to get through school. They learn Arabic up to the age of 15, French until end of Bachelor's degree, and English after that or whenever they want to start. While they showed interest in taking other classes, the students admitted that other classes would be too time-consuming and hassle to pick up during their schooling at a university.

15. How do people find out about events on campus?

We wanted to see what the current state of communication was on their campus. The students said they used Facebook to communicate or word of mouth.

16. Any tech solution that could promote campus events?

In order to understand the students perspective, we asked them for possible solutions. At first they were hesitant and said that it would be hard to make a separate app that people to use. If there was a new app, the students would have to get used to it, rather than continue to use

Facebook. After that, one student talked about an app that uses the same login as Facebook that would have all the events going on to inform the students. He then followed up by saying that if an event is not on Facebook then they will not know about it. From there other students started to open up, one suggested an app to tell how crowded common spaces are. This would let people know if they are able to go to the place and find an open space to work or an empty pool table to play on before going. From there, we asked some questions to get to know the culture of the students. We asked their main form of payment at cafes or other social places. They said that Morocco is not card friendly and people only use cash here. We asked how people keep track of who pays for what if they are all hanging out and they said people pay friends back with cash, or they pay for them next time they are together. This was shocking to us and we were curious if they had some electronic system similar to Venmo. The students had never heard of Venmo and said they only use cash. An interesting observation is that every student has a phone but there are not many apps that connect students.

After we finished our questions, the students were eager to learn about us and America. It was interesting to see they were just as interested in our lives as we were theirs. The students were all very friendly and just wanted to learn about what life is like in America. They asked a lot of questions about high school social dynamics. They were confused by ideas of social groups, racism, and bullying. All of these topics they do not experience in Morocco. It was interesting to hear that they don't have that here because nobody is as sensitive too sensitive. The only way the students learn about America is from movies because traveling is not common for students in Morocco. The session was then concluded and we thanked everyone for their participation.

Appendix M: Coded Interview with Professor Beloudha and Professor Bah of Ecole Mohammadia des Ingénieurs (EMI)

Overview:
We conducted an interview with two professionals at the Department of Computer Engineering at Mohammadia School of Engineers, which is located in the district of Agdal-Ryad. While it is not the same campus we are working with for our project, it allowed a new perspective to be gained on neighboring schools. We met with the two professionals, Professor Belouaha and Professor Bah. Professor Belouaha did not speak a lot of English so Professor Bah acted as translator. Professor Bah is a professor in the Computer Science Department. He also works on research in his minimal free time on wide networks. Professor Bah got both his masters in engineering and his PH.D. in Canada. Professor Belouaha is the Dean of the Computer Engineering Department and is involved in research. She is a leader of a research team in the Computer Science Department. After explaining our project and purpose for the interview, and having them sign our consent form, the interview began. We had a list of questions prepared, refer to Appendix E, and Liz and Sarah were chairs and Jordan was the secretary. From the interview, we learned a lot about their campus and atmosphere for the students.

Observations:
One thing we noticed right away is that this campus was very open. Unlike Madinat Al Irfane, this campus was surrounded by one wall but the different schools were not separated from one another. This also means there was only one guard at the entrance rather than guards at every school.

Interview:
Although the campus is very open to students in different schools, both professionals said that their main challenge is to make students work together. They have some project that relates all the fields, but it is hard to get them to collaborate due to time constraints. They informed us that unlike the United States, students do not do research along with their studies. Only PhD students participate in research after they have completed their masters in their respective studies. They also expressed frustrations in collaboration because there is no way to have students and faculty be virtually informed or connected. Mr. Bah liked our proposal to have a space that is communal to all students because it is good to physically connect people, but that is only the first step. He agreed that space for people to exchange information and collaborate is important but he was very focused on a platform for people to access information and network. While we thought the disconnect was from lack of cultural evolution, he said it was from lack of technological advances in Morocco. Since Morocco is a developing country, it is hard for them to gain the resources to upgrade their technology. The culture is to talk a lot and know everyone, but there is no way to network students from other campuses or even different schools on one campus. There is also no platform for information to be shared. There is nowhere that universities or professors

can post information for others to access. He expressed frustration in having good projects on their campus but there is nowhere to share projects for others who may be interested in partaking in it. He explained that the schools are still communicating by physically walking to the person and having a face to face conversation. A solution he proposed was to have an app on their smartphones that allowed others to see if an individual was online or offline. This would allow people to see if the person they want to contact was available to talk or not instead of wasting the time walking over to find out that person is busy. Along with this challenge, there is no flexible transport such as renting a bike to get you to a different campus more efficiently. Currently, there is no connection between different campuses. The professors and students at one campus have no way of communicating or collaborating with students and professors of another campus. Fortunately, at Mohammadia School of Engineers, there are all different departments, but people still do not connect with each other. One cultural thing that was mentioned in this interview was that people are used to working within a certain group of people because that is what they know and the people within that group know how to do a specific thing. Open space would allow people to take that first step to a more connected campus.

We learned a lot from discussing the topic of smart city with Professor Belouha and Professor Bah. They were both in agreement that the term smart city is so broad. Anyone can claim their project is working on a smart city because there are so many aspects to creating a smart city. People who are doing research can most likely relate it to some concept in implementing a smart city. For instance, they talked about data analytics. The analysis can be for any kind of data, but it can be worked on into a smart city element or it could be for something else. Professor Bah was strongly opinionated about having a project for smart cities to in order to apply to smart cities, and not just taking any project and relating it to smart cities. He claimed that all other colleagues are working on projects that can be applied to smart cities, but a city cannot build a smart city from one perspective. There are so many aspects that are some fields are independent from other fields but there also should be aspects of connection and collaboration. From the professionals, some examples smart city initiatives were discussed. Information Communication Technology (ICT) was of great interest for both Professor Belouha and Professor Bah. They said that this is how you introduce smart to a society. Having a smartphone is considered smart to them because it has applications that can do things on your behalf. Another topic they brought up was cloud computing and wireless network. This they believe is the heart of smart cities. It can impact the future of smart cities, but there are lots of other aspects. They both agreed that the term smart city contains a lot of different aspects. In talking about other smart cities, Mr. Bah said that it is really dependent on the cities wants and needs. Some cities may need just a few aspects to claim they are smart. The term is always changing because there are so many aspects and technology is always developing to be better and more efficient. An example they brought up is a smart factory. This is also an aspect of a smart city in their eyes and it is very important for the economy. Topics they listed off when talking about their views of smart cities were: smart economy, smart government, smart building, smart everything except people. Professor

Belouha was passionate about the concept of smart city and projects that are involved are a matter of engineering, not research. She said that possibly in 10 years, the research will it will happen but as of right now only engineering can bring some concrete solution to smart city and connectivity. She believes that to form Morocco's independence, the engineers are the ones who will build the new Morocco.

In this interview we also discussed challenges that Morocco faces with trying to implement change. Professor Belouha talked about the problem is that each department has to propose a new curriculum, theirs is based on new technologies. There is need for change in order to augment collaboration on campuses. The new curriculum introduces lots of new smart transport and big data. This is all stuff they want in their future Morocco, but it is only one building block to helping build the future smart cities and answer the question of connectivity. The issue education faces with this is that no one here is educated to teach it. Other issues Morocco faces is money. There is a disconnect between what the people promote want and what would need to make it happen. While they can dream about wanting change, there are many constraints. Mrs. Belouha said there is a disconnect between political and other people who are pushing for change. For instance, a person could say do this because they saw what other countries are doing , but realistically you Morocco is not at a place to enforce the same concepts as others. There is a lack of fund, contacts, and knowledge she said. With the aspect of money, the government only puts money and attention on a topic they think is important. Certain projects and research are happening because the government has money to spend on it and the time to give it attention. Mr. Bah concluded this topic by saying without funds, a project cannot be done.

Appendix N: Coded Interview with Professor Belhoussine and Professor Lamzah of National Institute for Urban and Territorial Planning (INAU)

Overview:

We conducted an interview with two professors at the Urban Institute called INAU. It is a University in the Mohammed V University system which is in Madinat Al Irfane. This interview was very insightful because it helped us understand smart city concepts from a different perspective. Due to ENSIAS being a school for computer engineering, all of our information we received from the previous interview has been very technological and technology focused. While it is important to have a platform and technological advances to enhance the quality of life for people in Madinat al Irfane, our interview with the urban planners helped us gain insight on understanding the physical and cultural aspect of changing Madinat Al Irfane. We met with two professors, Professor Belhoussine and Professor Lamzah. We also met with a student named Othmane Hanini. After our advisor, Professor El-Korchi, explained our project, school, and what an IQP is, the interview started. Professor Lamzah introduced herself first. She is the head of the pedagogical department. Her role is to organize the academic program in the university and teach people to learn and plan different courses for the students to enjoy. She is an architect who got her PHD in landscape architecture at the University of Illinois. She is now a professor and teaches courses in urban design, architecture heritage, and the history of architecture. Professor Belhoussine introduced herself next. She is an urban planner that trained in france and studied her masters at the University of Pennsylvania. Now she is a teacher in statistic and does research in her field. She also informed us that prior to Professor Lamzah being the head of the pedagogical, she held that position. Lasty, Othmane Hanini introduced himself. He is a student and one of his involvements on campus is that he is responsible for student body. He is studying his master and also hopes to get his PHD in Morocco.

Observations:

When we first arrived at the campus, we noticed that the school was much easier to enter and the buildings were more open and modern. We did meet a guard but he had the impressions we were coming and knew where to take us. Before we sat down for an the interview, we walked by a model that we later found out was created in a design class that the university provided for first year students. This model was of Madinat Al Irfane and it aloud us to visualize the space and see specific locations that were open and possible places for a collaborative environment. On this model we were able to verify a space we saw during our map and observations analysis. It is interesting to see how open armed and friendly people are when the meet you, but they have guards on each school ground to prohibit strangers from entering.

Interview:

After introducing ourselves, both professors were interested in getting us connected with the students on campus. Once we got the introductions out of the way, we asked the professor's what

their definition of smart city was in order to understand where they are coming from and what aspect to them means the most. To begin, the professors said that a smart city for Morocco needs to be put in context of a developing country. It is important that we are aware of that huge factor because it impacts every aspect. A major thing they said was that there currently is a huge gap between citizens. A definition of a smart city needs to be adapted to the community. In the interview they gave an example by saying a smart city in Boston has nothing to do with a smart city in Morocco. For them, a smart city needs to be sustainable and enhance the quality of life of the people being directly impacted by it. The quality of life and changes made to push for a smart city need to be tailored to the students here. When we talked about focussing on connectivity, the professors said we need to consider ways of connectivity that we wouldn't know because the lifestyle here is so different. They said in order to be the most impactful, we must be neutral and not let our own opinions influence the results. For instance when we brought up the aspect of the walls and how we brought it up in the focus group and the students had no idea what we were talking about because it is all they have known growing up. One professor reacted by saying yes there are walls, but it is not perceived as bad here because it is just the way it is. Along with understanding that the walls are just normal for the students in Madinat Al Irfane, the gated communities are as well. We learned from the focus group that each school seems to be its own community and the gates and walls around each campus validates it. Afterward, the other professor said don't judge, just try to understand from their perspective. Try to understand the people and the relationship between space and the needs of the people. For their definition they said a smart city answers the needs of its users, but the challenge is to understand who the users are and who will be most impacted. It is hard because the needs of different people may not be similar, but they are co-existing in one space that would be impacted by smart city initiatives.

Next, we asked about how smart city initiatives were being implemented in the university. The professors said that the university is involved in smart city initiatives. They informed us that last year there was research being done on campus that helped the professors get feedback on the campus. The students collected data and did statistical analysis as part of their research. From that research they found that students were complaining about the lack of infrastructure. They want more public services like a library and they wish to have commodities close by the campus. It seems that every activity outside of the school is a hassle and it is not encouraged for students to partake in those activities that are farther away. Even eating is a hassle if a student wanted to go somewhere not near their specific school.

After that we asked them how to make the universities more connected? Their reaction validated what the Computer Engineering Professors said about having no idea what other people are doing. The professors said that they have no idea what other schools are doing and that there should be a team. People need to work as a team and they believe that is the first step of a smart city. With the research done last year, there is data that backs up what we saw with lack of places for students to collaborate or hang out. It was interesting to hear their views on public

transportation. One of the professors said it is unfortunate to ride the tram to do everything like food or clothing shop.

To further understand what in Madinat Al Irfane should be changed or impacted with smart city initiatives, the professors brought up two aspects that impact change. There is a physical and social aspect. Madinat Al Irfane acts as an urban space and should be treated as one.The other one said we should find a lot of interesting issues that will help us determine what is smart for Madinat Al Irfane. To reiterate their point about understanding what the people want rather than enforcing what we think is a solution, they said that copying and pasting does not work because every situation is so different. The main challenge for us is how to define what is needed for the space of Madinat Al Irfane. We need to understand the elements and ingredients that will help better the quality of life. Something we were very interested to see in our focus group was if the students even wanted to connect. Through our research we found an underlying theme of connectivity in each theme we found for our definition, so we wanted to see if the students would even be interested in it. The professors validated this concern by saying find the answer of how students connect, if they want to connect, and how do they consider what a connection is.

One possible solution to improve collaboration is to enhance their yearly sports event. In the focus group, many students had lots of interest when we asked if they would like more frequent sports events for students to compete and play with one another. The professors really like the idea because we heard it from the students but they said we should understand how the sports event is and how we can make it better. We also need to understand what is happening at Madinat Al Irfane and how it can work better.

The last topic we talked about was sustainability. During our observations and time in Morocco we noticed that there are not a lot of trash cans open to the public or in public spaces. The professors said it is a resource issue and that we need to understand the general context. They informed us that many years ago there were people in charge of trash but now it's a private sector and their are no trash cans because of collection issues. Currently there are two issues with trash and public spaces. If there were trash cans, then people would take them. The other issue is the management. If the trash is not collected in an efficient manner then it becomes a health issue. It was very interesting to hear that there is a cultural aspect to trash in Morocco. People want clean houses but they have no problem throwing their trash in public. They like to keep the house clean
but can throw things out because the government will take care of it. This create a us vs them mentality which makes a divide in society. While we initially thought this may be lack of education or income, the professors said that this happens no matter your financial status. Both rich and poor neighborhoods struggle with trash. It is simply just a cultural manner.

Appendix O: Coded Interview with Professor Ghazouani of Entrepreneurship Center

Overview:
We conducted an interview with professors at the Entrepreneurship Center which is apart of Mohammed V University system in Madinat Al Irfane. We arrived at the center with Professor Berbia and Mohamed Salhi. Professor Berbia is the head of the Department of Embedded Systems. Mohamed Salhi is a PHD student who is the president of the student body at Ensias. He is helping with our project and translating if needed. We met with five PHD students and the head of the Entrepreneurship Center, Professor Ghazouani.

Observations:
Our observations of the center were very clean and modern. We did not encounter any guards while walking to the center or entering it. When we arrived, Professor Ghazouani was in another meeting so we waited in an empty conference room with three of the five PHD students. There was a language barrier between us and the Professor and some students. Mohamed did most of the translations for us, so it was challenging to understand and connect with them at times.

Pre Interview:
We met three of the PhD students before the interview started. They were excited to learn about us and our project. One of the students works with Artificial Intelligence techniques to improve network function placement problems with architecture. The other PhD student said she worked in accommodation system. She applies the algorithms in different fields. She said to start with smart internet for students. One is in big data, she explained her role as a commander and wants a product that varies based on personal behavior of people where you can change the behavior of data to get what you need. She explained that this is done by optimizing algorithms. Another student said they worked in intelligence system security. She is here to find a subject to work on, but she is interested in recommendation science. The next student said he was from the college of science, but he worked in the same lab as the woman who was in intelligence science. Two of the PhD students knew each other because they are a part of the same research center, but they are from different schools and working on different projects. The students talked about a science faculty from the engineering schools in the area. They all have different labs but the students do not work together. The two were very interested in applying Artificial Intelligence to architecture and system security. When we discussed the topic of smart cities, the students were first confused. They then related what were were talking about to their terminology of innovation cities. When we discussed our project they said there is a project like ours happening in Casablanca but it is not finished yet. They did not go into too much detail but the project works on connections of IT services.

Interview:

After speaking with the students, they came with us into a room with Professor Ghazouani and two of her assistants. The three PHD students joined us and two more joined in later. Before the meeting officially started, Professor Ghazouani welcomed us all to the University and Center of Entrepreneurship. While she spoke very little English, she was able to explain that she was the head of Entrepreneurship center. Mohamed had to translate most after that. He said that there is a space for students to be introduced to entrepreneurship at the university. There is also a space for students to research. In their university, there are fifteen small startups. Five of them are social enterprises and they add lots of value to research being done by the students at the university. After her initial remarks, Mohammed explained our project to Professor Ghazouani and her two assistants. Her two assistants did not talk at all in the meeting. Mohammed also explained WPI and the two project requirements we have, IQP and MQP. From this, Professor Ghazouani said she helped with a project for smart city in Madinat Al Irfane before.

Once everyone introduced themselves and our project was explained, we were able to begin our questions. Unlike the other interviews, we were able to ask a specific question and get feedback separately. The conversation did not flow as well as the others because there was a language barrier. The interview was very choppy. We asked a question, Mohamed had to translate. Anyone in the room would then respond and Mohamed would summarize and translate it back to us. The PHD students were able to speak English, but it seemed like they were more there just to observe.

We began the session by discussing our objectives with the lack of connectivity in Madinat Al Irfane. We discussed the challenges Madinat Al Irfane faces with connectivity in both a cultural and physical aspect. We took what was said in our Urban Planning interview and provided information for this one. Objective one is to identify a connectivity initiative that will interconnect the main stakeholders. Objective two is to identify a location where a connectivity initiative would be most impactful. Objective three is to develop recommendations to interconnect the district. After Mohamed translated what we said, Professor Ghazouani agreed with everything we had to say. She called the vice president of information systems at the university to see if he would talk to us and help further educate us. The meeting was very informal compared to what we are used to at home. Something we noticed that is different from at home is that everyone had their phones out on the table. We have noticed this from the very beginning and in all of our meetings. The expectations of phones is very informal and they are used throughout every meeting.

After talking about our objectives and lack of connectivity, we asked about their definition of a smart city. We have been asking in every interview in order to understand their perception and what their focus is on. Smart city is such a large and broad topic that every person you ask will have a different definition. Another thing we noticed is that people's backgrounds will influence their definition so we were interested to see how entrepreneurship would impact their definition.

Professor Ghazouani was very focused on the students. She said student resources such as PHD students need to see vision of smart city in order for it to happen. A smart city also has to see the needs of the environment, specifically the campus itself. From her perspective, a smart city needs to try and find solutions for mobility, communication, environment and everything that could impact people's daily lives. To give an exact definition, she said a smart city is where whole services are combined to improve their lives while respecting the environment. To her, things that are important to smart cities include Energy consumption, sustainable and having access to data. Professor Ghazouani really liked the idea of brainstorming ideas of smart cities. To be specific, she said how the students imagine the buildings should be how the future really is. The future needs to be based on the students because they are the center of the smart city. She really pushed the idea of listening to students. She said they are the beginning of the reflection and that students have many good ideas. They are sensitive to the campus and environment around them. Her main point was the future needs to make what the students imagine for it to be successful. To direct it more towards her personal influence, she said the role of the university is to make the students aware of the life they hope could exist in the future. She hopes the future will improve the world in general. Her specific contribution is see how the students see the future, and then help them emerge in the perfectional life. She believes that students will build their own and the future by building their own companies inside of the universities in Madinat Al Irfane. She strongly believes this is the best way to enhance their own life and the better world in general.

Next, we asked what is your opinion on connectivity of Madinat Al Irfane? Professor Ghazaouani's first response was that they don't have any connectivity inside of Madinat Al Irfane. She said there are different universities inside of the campus of Madinat Al Irfane, but there is no connection between them. There is one important institution named CNRST that is good at networking. In this university there is a center where one of the goals is to build connectivity. This university includes researchers from different institutes. The research is done by PHD and faculty. The university was restructured to make teams and the university centers more collaborative. Before there were just teams of one university and in the past each institute had its own team. Now they would like to incorporate others from different universities on one team. Professor Ghazouani informed us that the network is already exists to connect people. It is called MARWAN. This network is technology that will help connect the faculty and staff of different universities. There are clubs for students to meet and collaborate. An example she gave was Forem GENI. She did not know we had already talked and worked with them for our focus group. Forem GENI is a club that involved three different university. It is a perfect example of an aspect that builds connectivity in the community. Forem GENI is currently the only structure they have that gets students together and this is only with three universities. There are some clubs that are incubated at the presidency of the university, but they are just open to that university. All of the students from the university can come and join the clubs. There are also enterprises in each school. It is interesting to hear Professor Ghazouani initial reaction because she informed us that that there are some professors to pick students from all universities to

volunteer and build projects. In Madinat Al Irfane, there are twelve junior enterprises between the different universities. She also said there are competitions between other universities. These competitions can be both local and regional. This makes students collaborate all over. The team is constructed from all students in Madinat Al Irfane. She also said there was a competition of Entrepreneurship that last three or four months. This competition is not just technical or engineering based, it consists of all kinds of disciplines and has multi-disciplinary teams. The professors who supervise are also from different majors. This was very important to hear about because it shows there is some collaboration that already exists in Madinat Al Irfane, it is just not regulated or informed to others.

Following that question, we asked if there was nny form of connectivity that they think could be improved? Their response was simple. There needs to be spaces not just clubs. These spaces need to be neutral where people can just hang and meet up. There needs to be a common space for all students. This was such an interesting point because Professor Ghazouani explained the issue with adding common spaces to Madinat Al Irfane. This leads us to our next topic to discuss. We transitioned the conversation to talk about open spaces and Professor Ghazouani had lots to say. There is a space on her campus that will allow students to work, but it is very small. She hopes that each institution in her campus will have the same place in the future. There is a problem with adding open spaces to campuses around Madinat Al Irfane. There cannot just be one space for all the students, because the university is so large. They would like to make spaces that students can use no matter your affiliation to a school. The goal is to have each university create a space that has a space for any student to work because it is not realistic to have only one space for all students to go. They are currently facing that challenge with the national library because it is not in the district, but there are too many people that would use it. The students in the focus group said that the national library is not helpful because too many students would access it and it is too far away from their resources. A problem Madinat Al Irfane faces with implementing common spaces for students to work is that the one who has to build the space is not the university it is the region. Professor Ghazouani said that the builders should be people higher up because the university is one of many inside of Madinat Al Irfane. She brought up a really interesting aspect when she said to join everyone it would have to be the region who has to offer the space and each institution can put money into the space to make it nice. Her point was that if only one university makes the space, then the others don't feel like it is their own. She also brought up an interesting point that the Mohammed V University is one of a few that are in Madinat Al Irfane. At the end of the tram way the schools do not belong to the Mohammed V University. The buildings that will be built in the future to incorporate other students will have to be neutral space that every school and university feels welcome in. The only way to do this is if higher authorities put the buildings in place. She said it would have to be the region of three cities to truly make it a neutral space.

After this insightful information, we asked about the economy. If there is collaboration between companies and what can be done to bring more companies? There is thoughts of an innovation city being built at the university where there can be research and projects. Companies and startups will be able to have offices near the facility to enhance the student-company relationship. This will also help the university be connected to the needs of the economy. There are plans for three universities to have their own innovations cities. This is so the research of the university can connect with the economy better. The goal is to have researcher and developing companies come and do their testing, but also benefit from the university nearby. There is hopes to make the link between students and companies and the research that is done inside the university has a true meaning.

The last topic we discussed in our interview was having a platform or website for businesses to learn about research being done in the different universities. There are currently websites for each team or center at a given university, but there is no general website for all the universities or companies to look at. There is a university called CNRST where their role is to promote this vision to companies. This university is building technology that is going be national. Professor Ghazouani said that at this moment there are just individuals that communicate between each other. The interface exists and has existed for a while, but the link is not there. People do not trust companies from universities. She informed us that there's one event a year where enterprise and student meet, which is like our career fair. In the future, there needs to be improvement in languages to understand each other, meaning between companies and universities. Currently enterprises, researchers and students are not on the same page so there is no relationship between the education and professional world. This relationship does not exist because the companies think that the university wants to just get profit from them and not build that relationship. Ideally, each side should benefit from one another and build a relationship. There needs to be built trust. Along with the lack of trust between companies and universities, the research aspect struggles because of a problem of needing infrastructures or technologies to start it.

After the interview was over, we were able to go see the space that the university is building for students to collaborate. This space is brand new and very modern. They had open desks for students to work, office cubicles for private work, and computer labs for future students to utilize.

Appendix P: Excel File of Analyzed Survey Responses

Gender		**I would like a mobile application to notify me of events happening on campus.**		**Female**	**Male**
1	Female	3	Neutral	3	
1	Female	4	Agree	4	
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
1	Female	1	Strongly Disagree	1	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
1	Female	4	Agree	4	
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	3	Neutral		3
1	Female	3	Neutral	3	
1	Female	5	Strongly Agree	5	

1	Female	4	Agree	4	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	4	Agree		4
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
0	Male	5	Strongly Agree		5
1	Female	4	Agree	4	
0	Male	5	Strongly Agree		5
0	Male	5	Strongly Agree		5
1	Female	4	Agree	4	
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
1	Female	3	Neutral	3	
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	

1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	5	Strongly Agree		5
1	Female	4	Agree	4	
0	Male	4	Agree		4
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
0	Male	4	Agree		4
1	Female	4	Agree	4	
1	Female	3	Neutral	3	
1	Female	5	Strongly Agree	5	
0	Male	4	Agree		4
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
		4.41176471		4.36842105	4.53846154

Gender		I would like to have more common spaces to gather with friends outside of my campus.		Female	Male
1	Female	4	Agree	4	
1	Female	3	Neutral	3	
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
1	Female	1	Strongly Disagree	1	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
1	Female	4	Agree	4	
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	4	Agree		4
1	Female	4	Agree	4	
1	Female	5	Strongly Agree	5	

1	Female	3	Neutral	3	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	5	Strongly Agree		5
1	Female	4	Agree	4	
0	Male	5	Strongly Agree		5
0	Male	5	Strongly Agree		5
1	Female	4	Agree	4	
0	Male	4	Agree		4
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	

1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
1	Female	5	Strongly Agree	5	
0	Male	5	Strongly Agree		5
1	Female	4	Agree	4	
0	Male	3	Neutral		3
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
0	Male	4	Agree		4
1	Female	4	Agree	4	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	5	Strongly Agree		5
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
		4.49019608		4.44736842	4.61538462

Gender		I believe a centrally located library for all the schools in the district would be utilized.		Female	Male
1	Female	5	Strongly Agree	5	
1	Female	3	Neutral	3	
1	Female	4	Agree	4	
1	Female	4	Agree	4	
1	Female	1	Strongly Disagree	1	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
1	Female	3	Neutral	3	
0	Male	4	Agree		4
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	

1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
1	Female	3	Neutral	3	
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
0	Male	5	Strongly Agree		5
0	Male	5	Strongly Agree		5
1	Female	4	Agree	4	
0	Male	4	Agree		4
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
1	Female	4	Agree	4	
1	Female	5	Strongly Agree	5	

1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	5	Strongly Agree		5
1	Female	4	Agree	4	
0	Male	3	Neutral		3
1	Female	5	Strongly Agree	5	
1	Female	5	Strongly Agree	5	
0	Male	4	Agree		4
1	Female	5	Strongly Agree	5	
1	Female	3	Neutral	3	
1	Female	5	Strongly Agree	5	
0	Male	5	Strongly Agree		5
0	Male	5	Strongly Agree		5
1	Female	5	Strongly Agree	5	
		4.50980392		4.47368421	4.61538462